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AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA) KING COUNTY, WASHINGTON

Environmental Protection Agency
Seattle, Washington

13 June 1975

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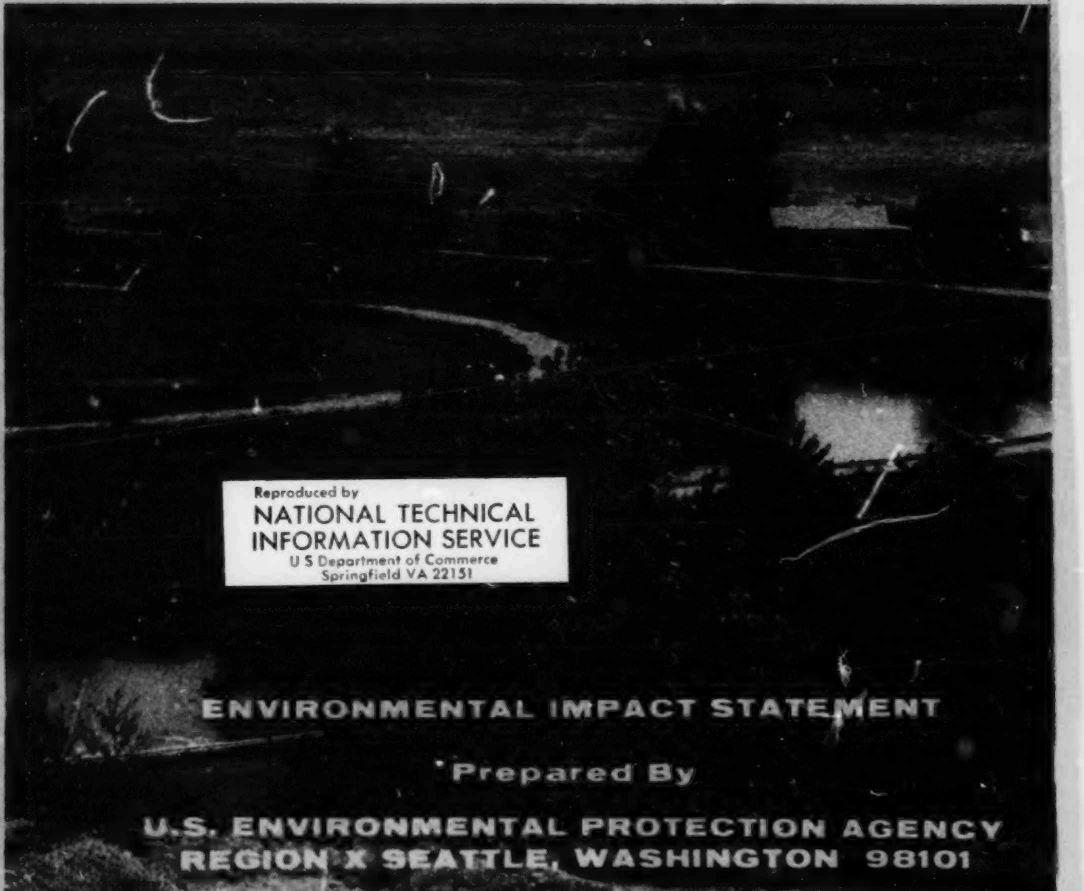
KING COUNTY, WASHINGTON
E.P.A. PROJECT # C-530475-02



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ENVIRONMENTAL IMPACT STATEMENT

Prepared By

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X SEATTLE, WASHINGTON 98101

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FINAL
ENVIRONMENTAL IMPACT STATEMENT

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)
KING COUNTY, WASHINGTON
EPA PROJECT # C-530475-02

Prepared by
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
SEATTLE, WASHINGTON 98101

Approved by:

C.V. Smith Jr. June 13 1975
Regional Administrator Date

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PREFACE

EPA Region X has received 23 letters of comment on the draft EIS. These comments were considered in reassessing the project and determining EPA's final decision. This final EIS documents that decision together with the various comments on the draft EIS used in the reassessment.

Although there were minor corrections in many subject areas of this EIS, major adjustments occur in the Air Quality and Adverse Impacts & Mitigative Measures sections. Major new additions to the text include discussions of agriculture in the Existing Land Use section, low-flow augmentation in the Water Quality Impact section and in Appendix E, and includes a chapter "Comments and Responses to the Draft EIS".

Many comments indicate concern with the secondary impacts of installing a sewerage system which is designed to handle a Year 2000 population of 175,000, as determined by the projections of the Puget Sound Governmental Conference. In general, these concerns relate to the validity of the population projections; the adequacy of local land use plans to protect the environment, including protection from urban sprawl; and EPA's conformance with regulations and guidelines established to protect the environment. These issues are answered directly in the comment section.

The alternative selected by EPA is the 72-inch interceptor. This alternative was chosen because it is designed to handle the expected population growth in the area, is the most cost-effective, and will cause no significant adverse primary impacts. The draft EIS and the comment process did not identify a more cost-effective or environmentally-acceptable alternative.

To some, such a decision may seem inconsistent with some aspects of environmental protection, particularly with regard to the potential for and impacts from urban sprawl. EPA does, in fact, find itself in a dilemma concerning sewers and growth. This dilemma is well-documented in a recent Congressional report (Interim Staff Report of the SubCommittee on Investigations and Review, Committee on Public Works and Transportation, U.S. House of Representatives, on the Federal Water Pollution Control Act Amendments of 1972, April, 1975). It states: . . . "in the absence of a clearly-defined federal land use policy, and with obvious public ambivalence over economic and environmental issues, how can EPA be expected to make local growth and non-growth judgments?

In protecting the environment, EPA does not have a mandate to stop growth and alter land use patterns. This is a fundamental responsibility of local government. Local and regional officials agree that growth will occur in the Green River valley with or without this interceptor. Therefore, EPA must seriously consider growth potential and development pressures as a major factor in assessing future sewerage needs to protect water quality, because EPA does have a mandate to protect water quality.

It is also true that EPA has mandates to prevent adverse impacts on such areas as wetlands and flood plains. EPA cannot. however, protect these by a broad-brush approach of stopping or controlling growth or land use. When these areas are directly infringed upon in terms of impending primary impacts, EPA can then exercise its legislative mandate to avert environmental damage from projects in which EPA is participating.

In the meantime, EPA will help assure environmental protection to the fullest extent possible at this time by imposing on the 72-inch interceptor the following grant conditions:

1. The grantee shall revise the alignment of the interceptor so as to completely avoid passage through any portion of the 20-acre wooded swamp Type VII wetland located immediately south of 277th Street.

2. The grantee shall develop procedures and provide assurances satisfactory to the Environmental Protection Agency that all extensions, connections, laterals, and sewer mains proposed to discharge into the facilities constructed under this project shall be developed in accordance with approved service area boundaries and applicable statutory or regulatory environmental and zoning requirements.

3. The grantee shall assure adequate monitoring of onsite environmental effects of the construction of the interceptor through provision of an onsite project inspector whose duties shall include compliance with regulations and recommendations of the environmental agencies including, EPA, DOE, PSAPCA, Dept. of Fisheries, and Dept. of Game. The inspector shall be responsible to immediately notify Metro management of changes which are necessary in construction techniques to minimize adverse impacts on the environment. Metro shall take whatever action is required to implement construction techniques which protect the environment. The inspector shall be knowledgeable in the area of environmental concerns through training and experience. Periodic reports shall be prepared at not less than monthly frequencies by this inspector to inform Metro of any deficiencies in compliance by the construction contractor and to identify any problems and problem resolutions which have occurred. A summary report for the project shall be prepared and a copy sent to EPA which briefly summarizes any problems and resolutions. Environmental amenities related to air, water, noise, solid waste. pesticides. and fish and wildlife shall be addressed.

4. The grantee shall forthwith explore the possibility of low-flow augmentation of the Green River through consultation with the Corps of Engineers, the Department of Fisheries, and the City of Tacoma, in consultation with the State DOE's management of water rights in the State of Washington.

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SUMMARY SHEET FOR FINAL ENVIRONMENTAL IMPACT STATEMENT
AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA)
KING COUNTY, WASHINGTON

Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

1. Type of Statement: Draft ( ) Final (X)

2. Administrative Action

3. The subject action for this Environmental Impact Statement is the awarding of grant funds to the Municipality of Metropolitan Seattle (Metro) for the construction of an interceptor sewer line in King County, Washington to service the Green River Sewerage Area. The present total estimated project cost is $10,417,700 for approximately 7.1 miles of pipe sized from 72" to 36". Metro's "Environmental Impact Statement on Auburn Interceptor," dated January, 1974, was used by EPA as a major resource document for the preparation of this environmental impact statement.

4. The project would result in the elimination of the discharge, to the Green River, of inadequately treated wastewaters from the City of Auburn lagoon system and would be a segment in the extension of a regional wastewater collection system providing for (1) the elimination of wastewater discharges to the Green River and its tributaries; (2) discontinuance of use of septic tanks in unsuitable soils in the Green River Sewerage Area; and (3) the removal of the constraint on growth and development represented by a lack of adequate sewer service.

Major adverse primary impacts and mitigative measures are:

a. The construction corridor passes through easterly margin of one small area identified as a permanent wetland. Mitigation of the impact on this area could be provided by (1) specifying summer construction, a narrow area to be disturbed and replacement of both seeded and wooded vegetation; or (2) relocating the pipeline to avoid the wetland.

b. Wastewaters intercepted by the project would be treated at Metro's existing secondary treatment plant at Renton. Effluent is discharged to the Green-Duwamish River at Renton; waste sludge is pumped to Metro's West Point treatment plant for digestion. Water quality in the Duwamish estuary could be affected by the projected increased effluent discharged from the Renton plant. This potential impact is being minimized by dechlorination and could be minimized further by low flow augmentation (if this proves feasible) and, if necessary, advanced treatment. Sludge presently is removed from the West Point plant by trucks, which pass through residential areas en route to disposal sites. Ultimate disposal method has not been determined yet; however, mitigation of this impact could include removing sludge by barge or providing digestion facilities at other locations such as the Renton plant.

c. No adverse impacts are anticipated on archaeological, historical or cultural resources; however, a preliminary survey of the construction right-of-way shall be made before construction begins to determine if any unique sites would be damaged by the proposed construction. If any areas are identified, measures will be taken to avoid irreparable damages.

Major adverse secondary impacts resulting from growth and development in the Green River Sewerage Area are:

a. Surface water quality will decrease due to urban runoff and to slightly reduced recharge of ground water. Mitigation of this impact could include regulation of runoff by ponding storm water to minimize flood hazards, frequent cleaning of paved surfaces and storm sewers and by low flow augmentation from stored water upstream. Impacts on the native fishery could be mitigated by enhanced hatchery production.

b. Concentrations of total suspended particulates were found to exceed the secondary standards in 1973 air samples taken at Auburn and are projected to be higher by 1990; however, the primary standards, concerned with public health, are not expected to be exceeded. Mitigative measures could include elimination of slash burning, improved mass transit and reduced automobile traffic, conversion from fossil fuel to electricity for heating and technological improvements.

c. There is a potential for loss of wetlands, vegetation and wildlife habitat, given the present local land use plans. Mitigation of this impact could be provided by amending these plans or by the acquisition of wetlands and other sensitive areas by local governments, conservation agencies or societies. The environmental effects of specific projects, including future interceptor extensions, would be subject to evaluation in accordance with provisions of the Washington State Environmental Policy Act, the National Environmental Policy Act, or both.

d. Needs associated with growth and development permitted by local land use plans include sewer service, water supply, transportation, power, schools, open space and recreational facilities, shopping areas, fire and police protection, health facilities, and solid waste collection.

Any impacts of providing these facilities and services could be minimized with proper planning by local governments.

5. Alternatives considered were the "no action" alternative; the upgrading of the Auburn lagoon system; a year 2030 interceptor design; two staged interceptor designs; and construction of a conventional secondary treatment plant at Auburn.

6. The following State, Federal and local agencies and interested groups were invited to comment on the environmental impact statement.

FEDERAL AGENCIES

Council on Environmental Quality
U.S. Dept. of Agriculture, Soil Conservation Service
U.S. Dept. of Defense, Dept. of the Army
U.S. Dept. of Interior, Bureau of Outdoor Recreation
U.S. Dept. of Interior, Fish and Wildlife Service
U.S. Dept. of Transportation, Region X
U.S. Dept. of Health, Education, and Welfare, Region X
U.S. Dept. of Housing and Urban Development, Region X
Advisory Council on Historic Preservation

Members of Congress

Henry M. Jackson U.S. Senate	Brock Adams U.S. House of Representatives
Warren G. Magnuson U.S. Senate	

State

Governor of Washington
Office of Community Development
Office of Program Planning and Fiscal Management
Office of Environmental Health Program
Washington Future Program
Dept. of Ecology
Dept. of Fisheries
Dept. of Game

DEPT. OF HIGHWAYS
DEPT. OF NATURAL RESOURCES
DEPT. OF SOCIAL AND HEALTH SERVICES
HEALTH SERVICES DIVISION
PARKS AND RECREATION COMMISSION

REGIONAL & LOCAL

MUNICIPALITY OF METROPOLITAN SEATTLE
PUGET SOUND GOVERNMENTAL CONFERENCE
PUGET SOUND AIR POLLUTION CONTROL AGENCY
RIVER BASIN COORDINATING COMMITTEE
KING COUNTY
PIERCE COUNTY
CITY OF AUBURN
CITY OF KENT
CITY OF ALGONA
CITY OF PACIFIC
CITY OF BLACK DIAMOND
CITY OF SEATTLE
CASCADE SEWER DISTRICT

INTERESTED GROUPS

NATIONAL AUDUBON SOCIETY
FRIENDS OF THE EARTH
GREEN BELT AT THE LOCKS ASSOCIATION
LEAGUE OF WOMEN VOTERS
MAGNOLIA COMMUNITY CLUB
NORTHWEST STEELHEADER'S COUNCIL OF TROUT UNLIMITED

SIERRA CLUB
STEELHEAD TROUT CLUB OF WASHINGTON
WASHINGTON AIR QUALITY COALITION
WASHINGTON ENVIRONMENTAL COUNCIL
MERCER ISLAND ENVIRONMENTAL COUNCIL
P.L.A.N. KING COUNTY
MOUNTAINEERS
GREEN FOR TOMORROW

THIS DRAFT EIS WAS MADE AVAILABLE TO THE COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) AND THE PUBLIC ON APRIL 11, 1975. THIS FINAL EIS WILL BE MADE AVAILABLE TO CEQ AND THE PUBLIC ON JUNE 27, 1975.

Title II of the Federal Water Pollution Control Act (PL 92-500) provides authority to the Administrator of the Environmental Protection Agency (EPA) to make grants to State agencies and municipal corporations for the construction of publicly-owned treatment works. Eligibility requirements and procedures necessary to qualify for a grant are set forth in 40-CFR, Part 35, Construction Grants for Waste Treatment Works. The Federal share shall be 75 percent of the total cost found to be eligible.

The Municipality of Metropolitan Seattle (Metro) has requested funds to aid in the construction of an extension of an interceptor sewer from the City of Kent to the City of Auburn. The immediate result of its construction would be to eliminate the discharge to the Green River of inadequately treated wastewaters from the City of Auburn lagoon system. Effluent discharged from the Auburn lagoon does not meet the limits defined by EPA for secondary treatment of wastewaters. Over the longer term, the interceptor represents one phase in the development of regional sewerage facilities which would prevent or eliminate water quality problems in the Green River Sewerage Area.

As received by EPA, the project proposed by Metro was for construction of 7.1 miles of 78 and 42-inch diameter pipe, beginning at a connection to the Kent Cross Valley Interceptor and ending at the headworks of the Auburn lagoon system. Based on a service life of 50 years, the interceptor was designed to accommodate the peak flow from that portion of the Green River Sewerage Area anticipated to be served by the year 2030. The design peak flow of 114 mgd was based on Metro's extrapolation of PSGC projections of population and industrial growth for the year 1990.

Following a joint review by EPA and Metro, the maximum diameter of the proposed interceptor was reduced to 72 inches. Metro determined that a pipe of this size would be required to accommodate the design peak flow for the year 2000, as developed during studies of the River Basin coordinating committee (RIBCO), a committee formed to make basin wide environmental waste management studies.

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HISTORY OF PROPOSED ACTION

Metro is a municipal corporation, authorized by State law and approved by the voters, to deal area-wide with water pollution. To this end, the corporation is empowered to prepare a comprehensive water pollution abatement plan; to acquire, construct, operate, and regulate the use of metropolitan facilities; to fix rates and charges for use of metropolitan facilities; and to establish minimum standards for the construction of local sewer facilities and approve plans for their construction.

Regional sewerage service to the Auburn area has been a part of Metro's Comprehensive Plan since its adoption. Extension of an interceptor is shown in the 1974 Plan revision as a part of second stage facilities planned for construction between 1974 and 1985. Connection to the Metro system is recommended in the 1968 Comprehensive Sewerage Plan for the City of Auburn.

On the State level, the Washington State Water Pollution Control Commission, the predecessor of the Department of Ecology (DOE) published in 1970 an implementation and enforcement plan as a supplement to the intrastate water quality standards. Under this plan, the City of Auburn was advised, on February 17, 1970, that it must intercept its sewage from the Auburn Lagoon and connect to the Metro system. Later that year, the DOE placed a ban on further extension of Auburn's local sewerage system until Auburn and Metro worked out a service agreement. The proposed link up with the Metro system was to have been operational by April, 1973.

In fulfillment of one of the requirements for financial assistance from EPA, Metro prepared and made available to the public, on November 13, 1973, an environmental assessment of the proposed interceptor extension, identified as the "Auburn Interceptor." A month later, a public hearing was held at the Auburn Legion Hall by the Sewer Committee of the Metropolitan Council. Participants included representatives from Federal, State, local, and regional governments, environmental groups, citizen's groups, and individuals. Further meetings, open to the public, were held in January and February, 1974. Following these meetings, the project was approved by the Metropolitan Council.

Also in January, approval came from the Puget Sound Governmental Conference (PSGC), after resolution of differences between its Interim Regional Development Plan and the City of Auburn's Comprehensive Land Use Plan.

On February 27, 1974, Metro applied to EPA for a grant (EPA ID # C530475-02) for Federal funding of the Auburn Interceptor. On April 18, 1974, the DOE held a public hearing on the Project Priority list, which included the Auburn Interceptor. Following this hearing, the State placed the project on the priority list. Only projects on this list are eligible for Federal funding.

On December 21, 1974, the DOE issued Metro an NPDES (National Pollutant Discharge Elimination System) permit for the Renton Sewage Treatment Plant, which requires the construction of an interceptor to transport wastes from Auburn to Renton.

In summary, the Auburn Interceptor had received official endorsement at the State, regional, and local levels of government by January, 1974. Metro had submitted a grant application and an environmental assessment; following independent review of the information submitted, EPA prepared an environmental impact appraisal, summarizing the project. Based on this appraisal, an initial decision not to prepare an environmental impact statement was made and, on January 10, 1975, EPA issued a negative declaration with the environmental appraisal, informing the public that an EIS would not be prepared on the proposed Auburn Interceptor project.

During the 15-day review period for the negative declaration, several environmental groups expressed concern about some of the impacts of the project discussed in the environmental appraisal. After reviewing this additional public input, EPA decided to prepare an EIS which would provide for further public participation in the issues raised. On February 3, 1975, a notice of intent to prepare a draft EIS was sent to the news media, to interested governmental agencies, and to environmental and other citizen groups.

To ensure the opportunity for public participation early in the preparation of the draft statement, EPA held a public meeting in Auburn on February 19, 1975. Notice of the meeting was given to the news media and mailed to over one hundred governmental agencies, groups, and individuals. Written statements were received and a transcript of comments made.

In May 1975, the DOE announced its intention to issue an NPDES permit for the Auburn Lagoon after a 30-day comment period. This draft permit contained a compliance schedule to attain adequate waste treatment. If the draft permit were issued, the City of Auburn would be required to submit, by May 15, 1977, either an agreement and time schedule for Metro's interception of Auburn wastes or an acceptable plan for achieving secondary treatment requirements at Auburn.

PURPOSE OF EIS

Most concerns expressed about the proposed project appear to be related to growth and development and to the attendant changes in land use attributable to providing sewerage facilities. There are, of course, many factors which influence growth and development, including the availability of all utility and community services; transportation facilities; and world, national, and local economic conditions. Nevertheless, to the extent that the construction of this project might be such an influence, EPA must attempt, in this EIS, to evaluate impacts resulting from growth and development.

Metro and supporters of the project feel that the extension of sewer service to individual properties is feasible only when a need for the service has been established. Further, Metro has evaluated the alternatives of a smaller interceptor project or the upgrading and expansion of Auburn's lagoon system and found them to be less cost effective than the proposed project.

Before awarding grant assistance for any treatment works project, the EPA Regional Administrator must determine that all applicable requirements have been met. This EIS is to assist in and document the administrative decision-making process. No final decision can be made until the NEPA impact statement process has been completed.

SEWERAGE AREA BOUNDARIES

The Green River Sewerage Area, which includes the Auburn Interceptor Service area, encompasses over 85,000 acres in southwest King County and a small portion of northern Pierce County. Its boundaries extend east and west from the town of Black Diamond to Interstate Highway Five and north and south from Lake Youngs to Lake Tapps. Included within this area is the entire Lower Green River valley in the vicinity of the cities of Kent, Auburn, Algona, and Pacific; portions of the Des Moines Plateau (West Hill) to the west; and the majority of the Black Diamond Plateau (East Hill) to the east of the Valley. (See Figure 1)

PHYSIOGRAPHY

The principal topographic features are the upland plateaus, Des Moines and Black Diamond, lining the valley to the west and to the east; and the flood plain of the Green River. The ascent to the upland areas is abrupt with a difference in elevation between the river bottom and the plateaus of more than 300 feet. The rolling, glacial topography of the uplands is spotted with depressions and hummocks in which stream courses and drainage patterns are often poorly defined. Numerous local basins and depressions have become small lakes, swampy areas, and bogs because of inadequate drainage.

The Lower Green River valley is a mature flood plain. This broad, alluviated valley was formed from thousands of years of flooding and sediment disposition by the Green and White Rivers. Steep valley walls border this valley to the east and west, which limits the natural floodway. Man has altered the natural flood plain condition of the Green River valley. The Green River is artificially controlled by an upstream dam, the Howard Hanson Dam, and by man-made levees, which parallel the stream throughout most of its length within the sewerage area. As a result, natural overbank flooding has been eliminated from most of the Lower Green River valley.

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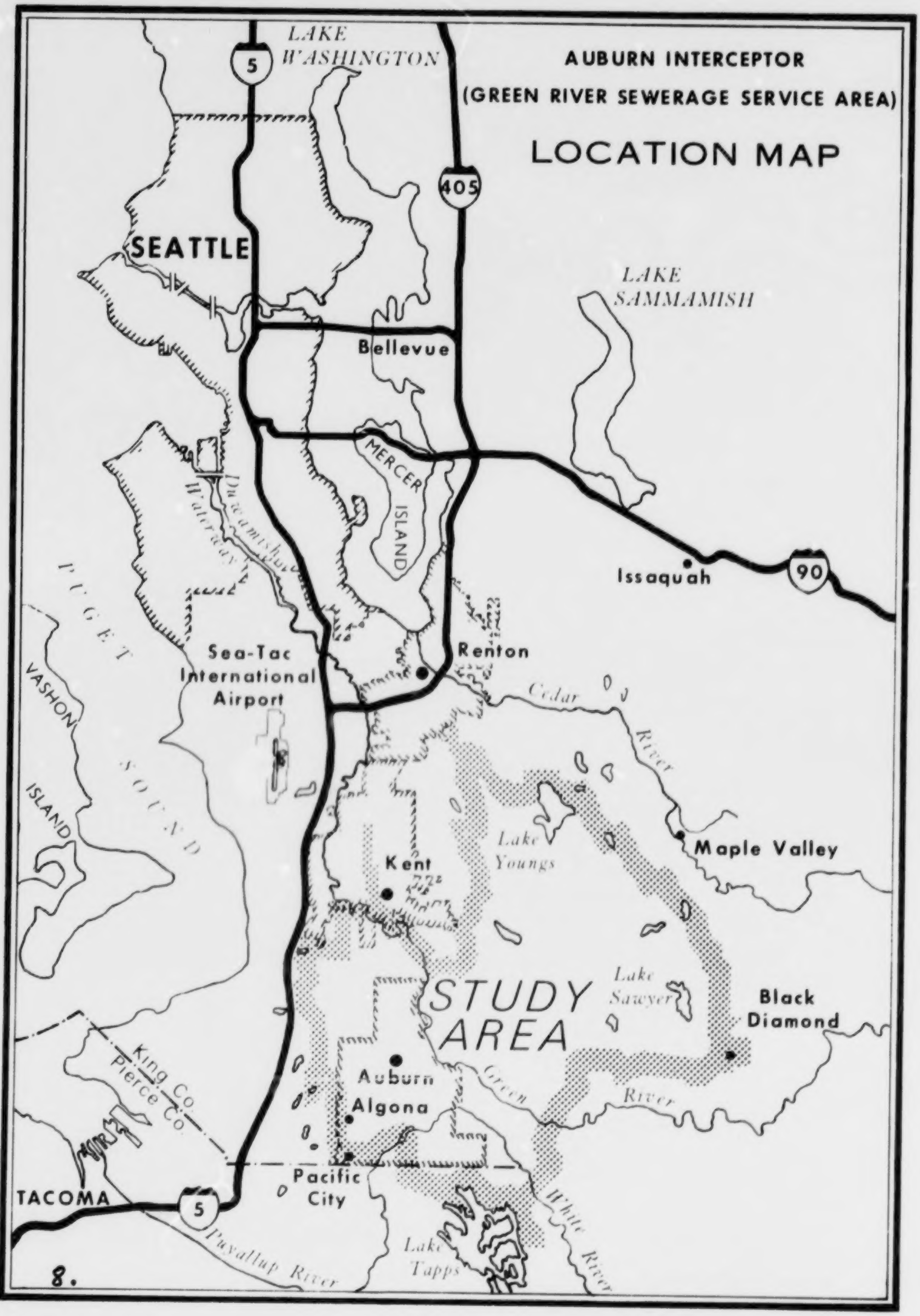

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE SERVICE AREA)

LOCATION MAP

LAKE WASHINGTON
5
405
SEATTLE
LAKE SAMMAMISH
Bellevue
MERCER ISLAND
Duwamish Waterway
PUGET SOUND
VASHON ISLAND
Issaquah
90
Sea-Tac International Airport
Renton
Cedar River
Lake Youngs
Maple Valley
Kent
STUDY AREA
Lake Sawyer
Black Diamond
Auburn
Algona
Green River
King Co.
Pierce Co.
Pacific City
TACOMA
5
White River
Puyallup River
Lake Tapps
8.

FIGURE 1

HISTORY OF THE GREEN RIVER VALLEY

Up to the time of the first ice age, the Green River area was intermittently covered by seas and was influenced by periods of volcanic activity to the east. These events helped to turn this area from an underwater basin to a broad plain similar to modern deltas.

The subsequent invasion of glaciers carved this plain into a valley. The Vashon glacier 14,000 years ago covered the entire area with a 3,000 foot thick layer of ice. This final glacier further deepened the river valley and formed the hills now standing parallel to it on the east and west.

As the ice retreated further north, the Straits of Juan de Fuca became ice-free and the ocean invaded the Green River valley. In the 10,000 to 15,000 years since glacial activity in the valley, this embayment has slowly filled with alluvium carried by the White, Green, and Cedar Rivers. The Green and Cedar Rivers built large deltas into the deep water of this embayment. When the water slowly receded, a flood plain was created filled with a series of bogs and swamps.

About 5,000 years ago, the Osceola mudflow came down the White River valley from the flanks of Mt. Rainier. As a result, the White River was diverted to the Green River valley, where it formed two channels: one flowing to Puget Sound at Tacoma and the other at Seattle. Until 1906, when its entire flow was diverted southward into the Puyallup River during a flood, the White River was the predominant source of the sediments which were deposited as a large delta in the Green River valley embayment, covering the older deposits and filling the valley to nearly its present level.

The Indians hunted and fished in this region, then in 1850 agriculture came to the valley when the first white settlers began clearing the valley bottom. By 1870, most of the 25,000 acres of the valley was growing berries and vegetables. In 1946, a major flood occurred destroying many of the crops and forcing many people from their homes.

Following this disaster, the Corps of Engineers initiated several flood control projects on the Green River, including a dam, dikes and levees. Agriculture never regained the importance it had before the flood; many of the remaining farms have converted to dairy operations. In the late 1950's, the cities of Kent and Auburn began to annex land at a rapid rate and zone much of it for industry. Industrial and commercial development ensued. The valley today is a rapidly urbanizing area.

EXISTING LAND USE AND LAND USE TRENDS

EXISTING USES

The Green River Sewerage Area is characterized by a diversity of land uses: forestry, mining (gravel pits), open space, recreation, and scattered rural residential and agricultural uses on the eastern uplands; retail, commercial, and residential uses in cities and towns; and agricultural and industrial developments in the Green River valley. Photogrammetric interpretations of the sewerage area done by Metro's environmental assessment consultant in the Spring of 1973 reveal the following land use allocations:

TABLE 1. LAND USE ALLOCATIONS.

USE	ESTIMATED ACREAGE	ESTIMATED % OF TOTAL AREA
Woodland	37,700 A	40
Suburban Land (including low density residential, recreational home, neighborhood commerical areas)	15,780 A	17
Agricultural Land	9,030 A	10
Open/Vacant Land	8,720 A	9
High density residential and commercial areas	6,300 A	7
Transportation Corridors (including railroad yards and freeways)	5,890 A	6
Transmission Line Utility Corridors	4,140 A	4
Industrial areas	1,140 A	1
Recreational areas	410 A	0.5
Surface Water	4,250 A	5

Acreage designated as commercial probably includes some light industrial and warehousing establishments. In aerial photographs, it is often difficult to distinguish between these facilities and other commercial establishments.

Land uses adjacent to the proposed interceptor route range from rural classifications such as open land, pasture land and cultivated fields, to urban uses including residential neighborhoods, industrial plants, automobile distribution yards, and the Auburn Airport.

A visual survey of these adjacent land uses, however, does not necessarily convey their often tentative status. Almost all of the proposed interceptor route lies within the incorporated limits of Kent and Auburn. These cities have zoned most of the land through which the interceptor will pass to allow more intensive uses than those now occurring. For example, the land in Kent to be traversed by the interceptor is zoned for industrial use. Much of this land has been sold to investors and developers who are leasing the land to farmers until industrial development is feasible.

In other locations, land owned by industrial firms has been only partially developed with the remainder reserved for future expansion. Large portions of the Green River valley within the sewerage area, therefore, appear to be committed to open space or agricultural uses when in reality they are committed to industrial uses. See discussion on page 12a.

The only formal recreation facilities near or in contact with the construction corridor are trail routes: one is the undeveloped Kent Park Department trail system which utilizes the Puget Power right-of-way; and the other is the Green River Levee maintenance road. These trail locations have not been improved except for signs to mark their location. The Green River Levee is planned to eventually become a part of the Lower Green River Trail of the King County Urban Trails System. There are no other existing or planned parks or recreation areas in or near the construction corridor.

It should be noted, however, that the route will pass through two ecosystems, near South 228th Street and South 277th Street in Kent, that are considered to have informal recreation value. (See section on Existing Natural Vegetation, Wildlife, and Fisheries).

LAND USE TRENDS

Before 1950, the Green River valley was predominantly rural with large dairy operations and small truck farms. The valley cities were small, and most of the land was in unincorporated King County.

Today, the cities control approximately 73% of the valley lands and the observable land use trend is toward increasing urbanization.

A study completed by Corff and Shapiro, Inc., (The Green River Valley: A Study of Demand, Capacity and Trends, Draft, Sept. 1974) of an area which covers 33,320 acres of the Green River valley, extending from the valley floor to parts of the plateaus bordering the valley, clearly reveals this trend. The figures in Table 2 indicate that between 1965 and 1973 there has been a dramatic decrease in agricultural and open space land uses and a significant increase in industrial, residential, and commercial uses.

TABLE 2. LAND USE AREAS, 1965 & 1973*.

USE		1965	1973	% CHANGE
Industrial		1,150	3,130	+ 172 %
Power Lines		230	230	0 %
Commercial		250	700	+ 180 %
Residential	- Tract	2,420	4,220	+ 74 %
	- Non-Tract	3,690	3,990	+ 8 %
	- Multi-Family	80	160	+ 100 %
	- Mobile Homes	20	210	+ 950 %
Agriculture		14,370	9,020	- 37 %
Open Space	- Wooded	5,560	4,160	- 25 %
	- Non Wooded	3,290	2,700	- 18 %
Site Preparation		840	1,540	+ 83 %
Institutional		340	530	+ 55 %
Parks - Recreation		150	430	+ 186 %
Transportation - Freeways		80	920	+1,050 %
Gravel Quarries		250	700	+ 180 %
Water		600	630	+ 13 %
Total		33,320	33,320	--

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*Data Sources: National Aeronautics and Space Administration color--infra-red aerial photography, NASA-Johnson Space Center Mission 212, Sept. 1972, scale 1:50,000, updated to 1973 using photography from NASA-Ames Research Center U-2 Flight 73-109, July 1973, scale 1:135,000. Photo interpretation and map compilation performed on the Bausch and Lomb Zoom Transfer Scope. Frank V. Westerlund, project consultant. Green River Valley AAM Districts only.

-A negative % means that area devoted to that land use has decreased.

The amount of land devoted to freeways has increased 1,050% because of the construction of the Valley Freeway, SR 167 (1972) and of I-5 (1966). Because accessibility is often critical in determining where development will take place, SR 167 has had a major urbanizing influence since its completion to Kent in 1969 and to Auburn in 1972. Direct high speed access to the southern part of the valley and visual and noise impacts resulting from the freeway have had noticeable effects on the neighborhoods in Kent. These middle-class residential areas near the proposed interceptor route have been transformed into less appealing areas.

The 83% increase in the amount of land used in site preparation is a clear indication of increasing urbanization. Associated with this particular use, land devoted to gravel quarries, primarily located on valley walls, has increased by 180%. Most of the site preparation activity has occurred on the valley floor, especially in the Renton-Tukwila area and in the vicinity of SR 167 near Auburn - Algona.

In the valley, agricultural land has been lost to three major types of uses: industrial development, site preparation and non-forested open space. Although development has encroached upon formerly cultivated lands, it is still largely scattered. The unused vacant lands, which fall into the "non-forested open space" category lie in blocks near or adjacent to these developed areas. As much of this land is zoned for intensive uses, planners view these vacant areas as the key to the valley's future. The rate and amount of development that will actually take place is, however, dependent on numerous factors such as the current stabilization of the valley population, on-going speculative land-filling and utility provision, the comprehensive plans and zoning ordinances of the local jurisdictions, and the state of the world, national, and local economy.

The process of development is well advanced and the pattern of land ownership, institutional and economic factors that govern land use are conducive to the continuation of the process. The proportion of valley land that is occupied for urban-industrial purposes exceeds that of either the Puyallup or Snohomish Valleys, the other areas of central Puget Sound that are suited for large scale development. Land ownership is concentrated in corporate hands that have assembled large parcels either for their own use or for speculative development. (Major land owners in the valley are the Boeing Company, Allied Stores, the three railroads--Union Pacific, Burlington Northern, and the Chicago, Milwaukee, St. Paul, Herb Mead and Associates, and the Shell Oil Company).

The transactions that created those large, essentially absentee holdings, in the late 1950's through the mid-1960's touched off an explosion in land values. In the northern parts of the valley, for example, the mean market price per acre of land rose from $4,630 to $8,950 in a single year and to $10,340 by the end of 1966 ("Land Value

Changes in an Area Undergoing Urbanization", M. T. Rancich, Urban Studies). The number of acres involved in transactions in the valley more than doubled from 1964 to 1965. Concommitant with these transactions that placed large parcels of agricultural land in corporate hands, the cities of the valley annexed large chunks of adjacent land--more than 16,000 acres were annexed by Auburn and Kent in the late 1950's and 1960's--and much of these lands were zoned for intensive uses.

Higher taxes and higher tax rates, resulting from inflated land values, made it both profitable and expedient for farmers and small land holders to sell their land to developers and speculators who could afford to hold the lands for future development or as an investment. Higher taxes are not, however, solely responsible for the loss of agricultural land to urban uses. In fact, records show that very few landowners have taken advantage of the Washington State Open Space Law (RCW 84.34) which allows assessment of property based on current use of agricultural and forest land, rather than "highest and best use."

By 1974, only 186 acres within the jurisdiction of the valley cities were under the current use assessment. Nationwide, the number of acres of prime agricultural land lost to urbanization annually is astounding and the issue is of critical concern to environmentalists, planners, and others. While the escalation of land values and assessment rates (the latter associated with annexation and zoning) are responsible for squeezing out vestigial agriculture in the Green River valley, numerous other factors such as (1) the profit motive, (2) the internment of Japanese-Americans during World War II, which virtually eliminated the entreprenurial base for diverse, intensive agriculture, (3) the post-war development of monoculture, food processing and efficient national distribution channels for agricultural products, and (4) simply, the loss of the farmer's interest to continue farming have collectively contributed to this phenomenon. As is true elsewhere, no one can dictate what the farmer or small landowner can or cannot do with his land if the desired use is consistent with zoning ordinances and local plans.

The extent and importance of the agricultural industry in the Puget Sound region is evaluated and emphasized in the Regional Agriculture Land Use Technical Study of the PSGC.* This study concludes that most of the agricultural production in the region (covering Snohomish, King, Kitsap, and Pierce Counties) would cease to exist if the rate of loss of cropland harvested and pastured were to continue at the current rate of over 3,000 acres per year. The report emphasizes that all of the factors contributing to the decline of regional agriculture (with the possible exceptions of federal inheritance taxes, minimum wage requirements and some environmental protection regulations) are manifestations of current local public policies and could, therefore, be alleviated through policy amendments by public action. This document is valuable for it defines the requirements necessary to allow agriculture to remain a viable industry and analyzes the existing potential means for achieving those requirements.

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*Regional Agriculture Land Use Technical Study - Central Puget Sound Region. Puget Sound Governmental Conference, July 1974

The perservation of vestigial agricultural lands cannot be overemphasized. Not only is agriculture currently a substantial economic asset to the regional community, but the commitment of land to agriculture provides flexibility and opportunity for future land use reallocation.

Overall evaluation of trends indicate, however that the trend toward urbanization in the Green River Sewerage Area is expected to continue. The stage for intensive uses is set; physical service requirements for industrial expansion and for the additional settlement of people are all in place. Rail lines have traversed the valley since the turn of the century. Major highways--SR 167, I-5, and I-405--installed during the 1960's and early 1970's have served as the prime lever on the substantial industrial, commercial, and population growth that has already taken place.

In summary, the interlocking, interrelated set of physical, institutional, and economic influences is leading the Green River valley toward:

(1) increasing urbanization,

(2) increasing industrial development on the valley floor,

(3) further loss of agricultural land,

(4) an increasing tax base,

(5) increasing tax burden on valley landowners due to increasing land values,

(6) high expenditures for services,

(7) increasing concentration of employment in the valley,

(8) possibility of increasing commuter trips, and

(9) increased expenditures for flood control and drainage.

EXISTING SOCIO ECONOMIC ENVIRONMENT

PRESENT ENVIRONMENT AND TRENDS

The Green River Basin is undergoing a transition from a subsistence farming economy that began with the initial clearing of the valley floor in the 1850's to commercial-industrial-suburban development as an extension of the City of Seattle. An interlocking set of physical, institutional, and economic influences has made, and continues to make, the Green River Basin the site of the most rapid population growth in the Seattle-Everett SMSA in the period between the most recent national censuses. As significant increases in population and employment are symptomatic of an urbanizing area, studies of the Green River valley indicate that this area will continue to be subject to increased development pressures.

Table 3 shows that population in the Green River valley increased almost three times as fast as in the SMSA as a whole. This substantial annual increase (7.2%) in an area that is largely dedicated to industrial and commercial purposes demonstrates the strong expansionary pull of local industrial emplacement. Although developed lands east of Lake Washington were at this time being built up primarily in a suburban residential fashion to serve some housing needs of the larger metropolitan area, people tended to move toward the less developed Green River valley area, perhaps to be closer to employment centers.

A recent PSGC study* of population and employment trends in the Green River valley indicates that while the valley population increased by 70% between 1961 and 1970, the valley employment jumped 250% in the same period of time. The 11,000 persons employed by Boeing at the new centers in Kent and Auburn account for about one-third of this increase. As indicated in Table 4, all employment categories registered increases well in excess of 100% over 1961 figures. WTCU (Wholesaling, Transportation, Communications and Utilities) increased by 330% and manufacturing by 600%. These substantial increases reflect the new Boeing facilities and the intensive business park development in the northerly portion of the study area.

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* Study area covered 32,320 acres of the valley floor and parts of the surrounding plateaus - Beam, Brian, "The Green River Valley - A Discussion Paper", February 14, 1975.

(Page 16 is omitted)

TABLE 3. POPULATION GROWTH IN THE SEATTLE-EVERETT SMSA 1960 - 1970

	Population (1000's)		Annual
	1960	1970	Change
City of Seattle	557.1	530.8	- 0.5 %
City of Everett	40.3	55.5	3.3 %
East Lake Washington	100.8	168.6	5.3 %
(Renton Division)	(41.8)	(64.4)	
(Overlake Division)	(59.0)	(104.2)	
Other King County	241.0	385.2	4.8 %
Other Snohomish County	131.9	209.7	4.7 %
Green River Valley	36.1	72.0	7.2 %
(Auburn Division)	(19.3)	(33.1)	
(Kent Division)	(16.8)	(38.9)	
Seattle-Everett SMSA	1,107.2	1,421.9	2.5 %

TABLE 4. GREEN RIVER VALLEY POPULATION & EMPLOYMENT

Year	Total Population	Total Employment	Retail	Services	Manufacturing	WCTU	Gov't Education
1961	34,441	8,509	1,847	1,031	2,082	1,037	1,161
1970	58,382	30,076	4,471	2,555	14,663	4,603	3,784

It is obvious that the socio-economic trends in the valley are toward (1) industrialization, (2) an increasing tax base, (3) an increasing tax burden on valley landowners, (4) high expenditures for services that may not be needed for many years, (5) increasing concentration of employment in the valley, (6) increasing commuter trips, and (7) increased expenditures for flood control and drainage.

Corff and Shapiro, Inc.[1] provide data which support these trends:

Increasing tax base. The assessed valuation per capita for Kent, Auburn, Renton, and Tukwila from 1950 to 1974 is shown in Table 5. Clearly all cities have increased their assessed valuation per capita. Tukwila has had the most dramatic increase, from $274 in 1950 to $26,211 in 1974, a factor of 95.

TABLE 5. ASSESSED VALUATION/CAPITA FOR VALLEY CITIES*

City	Assessed Valuation, $ Per Capita			
	1950	1960	1970	1973-1974
Kent	1,763	2,283	5,034	10,388
Auburn	544	1,918	4,443	7,977
Renton	1,100	2,540	7,526	11,232
Tukwila	274	614	7,845	26,211

* Source: Responses to letters from Keith Dearborn to Valley planning departments, February 1974.

Higher expenditures for services (that may not be needed for many years). The North Kent Industrial Area water project funded extensive improvements in a water supply system designed to serve a 3000 acre industrial zone north of Kent. The projected industrial development has not yet occurred. The total project costs were $2,774,217--a breakdown of funding is shown:

LID 252 = $ 486,257.97

LID 256 = 97,949.67

EDA = 510,700 + 264,300

Miscellaneous = 5,497.96 (sale of salvage, interest)

City Bonds = 1,726,781.92

TOTAL = $2,827,186.62

Kent's bonded indebtedness in 1974 was $490 per capita.

Increasing tax burden on valley owners. Increasing land values in the valley have resulted in higher taxes per acre, and tax rates themselves have risen. Tax information for 1950, 1960, and 1974 and the selling price and date of sale for two parcels of land in the Green River valley is shown in Table 6. These parcels are listed in the March 1974 printout of the King County Real Estate Monitor as Green River valley unimproved industrial land and acreage. Table 6 shows a steady increase in millage rates between 1950 and 1974 (note change in determination of ratio between 1960 and 1974). Land values rose significantly during this period. The King County Real Estate Monitor, March 1974, lists unimproved industrial land and acreage selling for up to $33,000 per acre. Clearly, valley landowners carry a heavy tax burden.

Increasing concentration of employment in the valley (with regional implications). In the period 1961-1970 employment in the Duwamish basin declined. In 1961 the Duwamish area had 55% of all manufacturing employment in King County; in 1970 this had dropped to 42%. During the same time period nonmanufacturing employment declined from 15% to 11% and total employment dropped from 28% to 18%. Employment in the Green River valley study area rose during those nine years, primarily due to the migration into the valley of the aerospace industry. Based on these observations, one may speculate that the desirability for industry to locate in the Green River valley may be one of the factors which has caused employment to decline in the Duwamish basin and, perhaps, elsewhere in the region.

Increasing commuter trips. This is supported by the decline in the population to employment ratio in the 1960-1970 decade from 4.5 to 2.5 for the study area. These ratios indicate that the number of persons living in the study area has not kept up with the increases in the number of persons who work there.

Increased expenditures for flood control and drainage. 30 million dollars were spent to build Howard Hanson Dam and to dike the Green River. The flood control and drainage system proposed by the Soil Conservation Service is projected to cost $38 million, $15 million of which must come from local governments. In addition, developers will find it necessary to fill to levels above the 100-year flood point to guarantee sufficient protection to the development, and this will also be expensive, since fill is currently running at approximately $1.65/cubic yard.

To provide protection from 100-year floods, additional expenditures are required for enlarging the channel capacity of the Green River to accommodate increased flows from the SCS drainage project.

TABLE 6. TAX CODES AND RATES*

		1950	1960	1974
1. NE 1/4 of SW 1/4 of 12-21-7	Code	not coded	0150	0140
SE Ly COR Freeway and 15 NW	Rate	47.50	62.60	46.88
Auburn	Ratio	25%	25%	50%

date sold - 2 January 1973 purchase price - $0.32/sq.ft. or $13,940/acre

		1950	1960	1974
2. Por Gov Lot 2 in N1/2 of 11-22-4	Code	not coded	0501	1525
21250 Russell Rd., Kent	Rate	46.10	75.00	43.46
date sold - 25 June 1969	Ratio	25%	25%	50%

purchase price - $0.24/sq. ft. or $10,454/acre

Rate = mils; one mil = $1.00/$1000 assessed value

Ratio = assessed value as percent of market value

	Type	1950	1960	1974
Code 0140 Auburn Area	Consolidated (State, County, port)	15.70	14.80	6.83
	Auburn (city services)	16.80	17.50	8.76
	School District 408	15.00	30.30	31.29
	TOTAL	47.50	62.60	46.88

	Type	1950	1960	1974
Code 1525: Kent Area	Consolidated (State, County, port)	15.70	14.80	6.83

TABLE 6. (Continued)

		1950	1960	1974
Code 1525:	Kent (city services)	15.00	16.80	7.60
Kent Area	School District 415	12.50	42.40	28.50
(Continued)	Hospital H-1	2.90	1.00	.53
	TOTAL	46.10	75.00	43.46

* Source: Mr. Wirth, King County Assessor's Office, 7-8 August, 1974, by his courtesy.

HISTORIC ENVIRONMENT

Officially recognized historic properties in the vicinity of the proposed interceptor construction are listed below, as identified on the Washington State Register of Historic Places and the state inventory of historic places:

Alvord's Landing:	N47°22'01", W122°14'08"
Maddocksville Landing:	N47°24'16", W122°16'20"
Langston's Landing:	N47°22'36", W122°14'52"
White River Massacre Site:	N47°21'35", W122°13'23"
Downey Hop Barn:	One mile west of Valley Freeway on Green River
Auburn Railroad Station	
Seattle-Tacoma Interurban Right-of-way	

The only Auburn site on the National Register of Historic Places, the Aaron Neely Mansion, is considered to be outside the project's direct impact area, as are all of the state historic sites except the Seattle-Tacoma Interurban right-of-way. The old Interurban right-of-way lies immediately to the west of, and generally parallel to, the existing Chicago, Milwaukee, St. Paul, and Pacific Railroad track and is coincidental with the Puget Power and Light Company right-of-way and a partially developed recreational trail. Portions of the proposed interceptor route are adjacent to this historic site and at one point (29th Street N.W.) the interceptor would cross under the Interurban right-of-way.

There is no known archeological site in the construction route.

EXISTING WATER QUALITY

HYDROLOGIC CONDITIONS

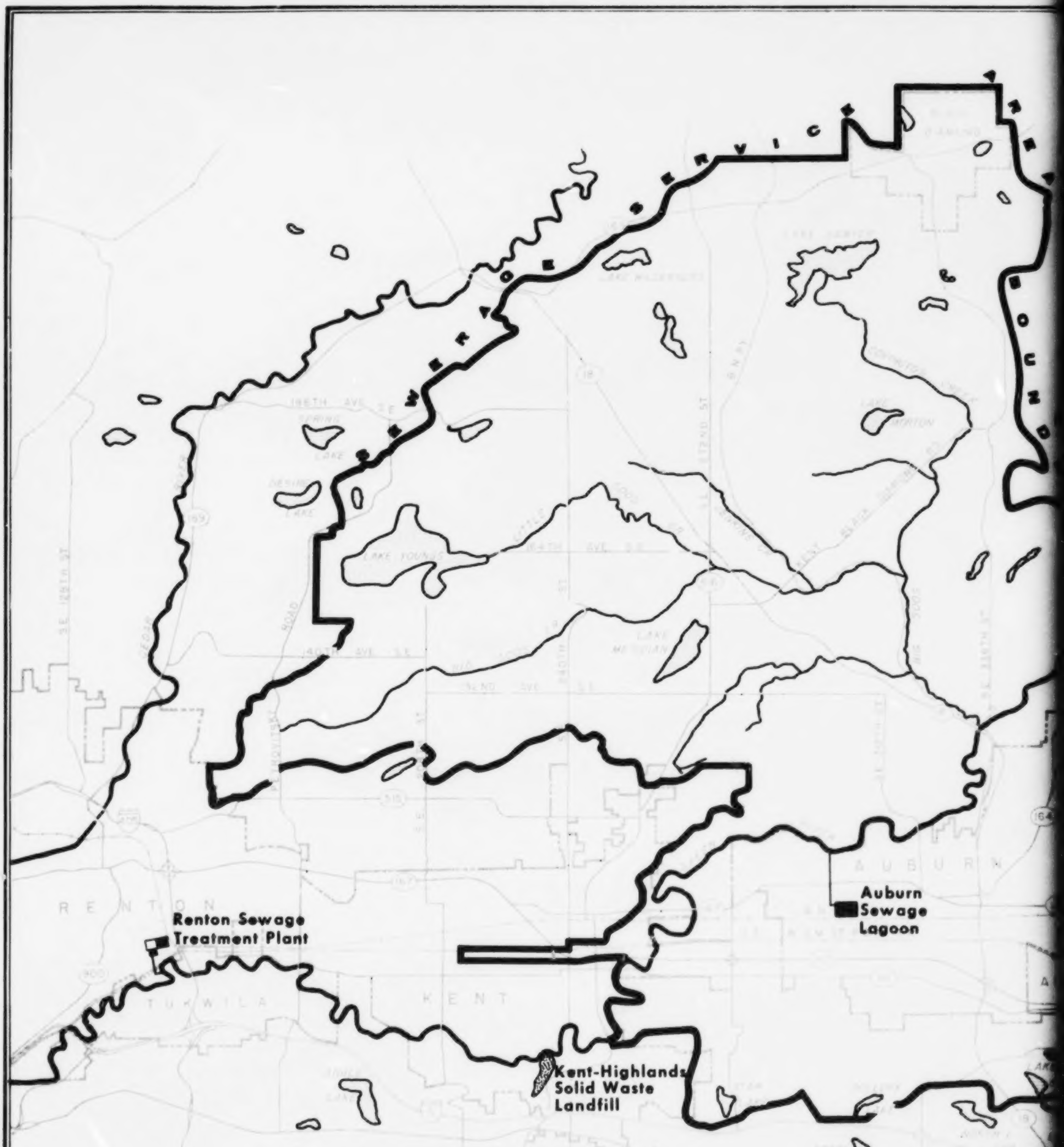
The Green River Sewerage area is rich in water resources (see Figure 2). Two major rivers, the Green and the White, traverse the area as well as a number of important smaller creeks and streams including Mill Creek and Big Soos Creek. About sixteen lakes, each over 20 acres, are located in the sewerage area. Other lakes and wetlands add to the diversity of water resources.

SURFACE DRAINAGE

Before 1906, the White River and its tributaries, the Green and the Black Rivers, flowed northward through what is now called the Green River valley, frequently shifting the river channel into various meander patterns. Remnants of the old river channels left many sand deposits, natural levees, and oxbow lakes (cut-off meanders).

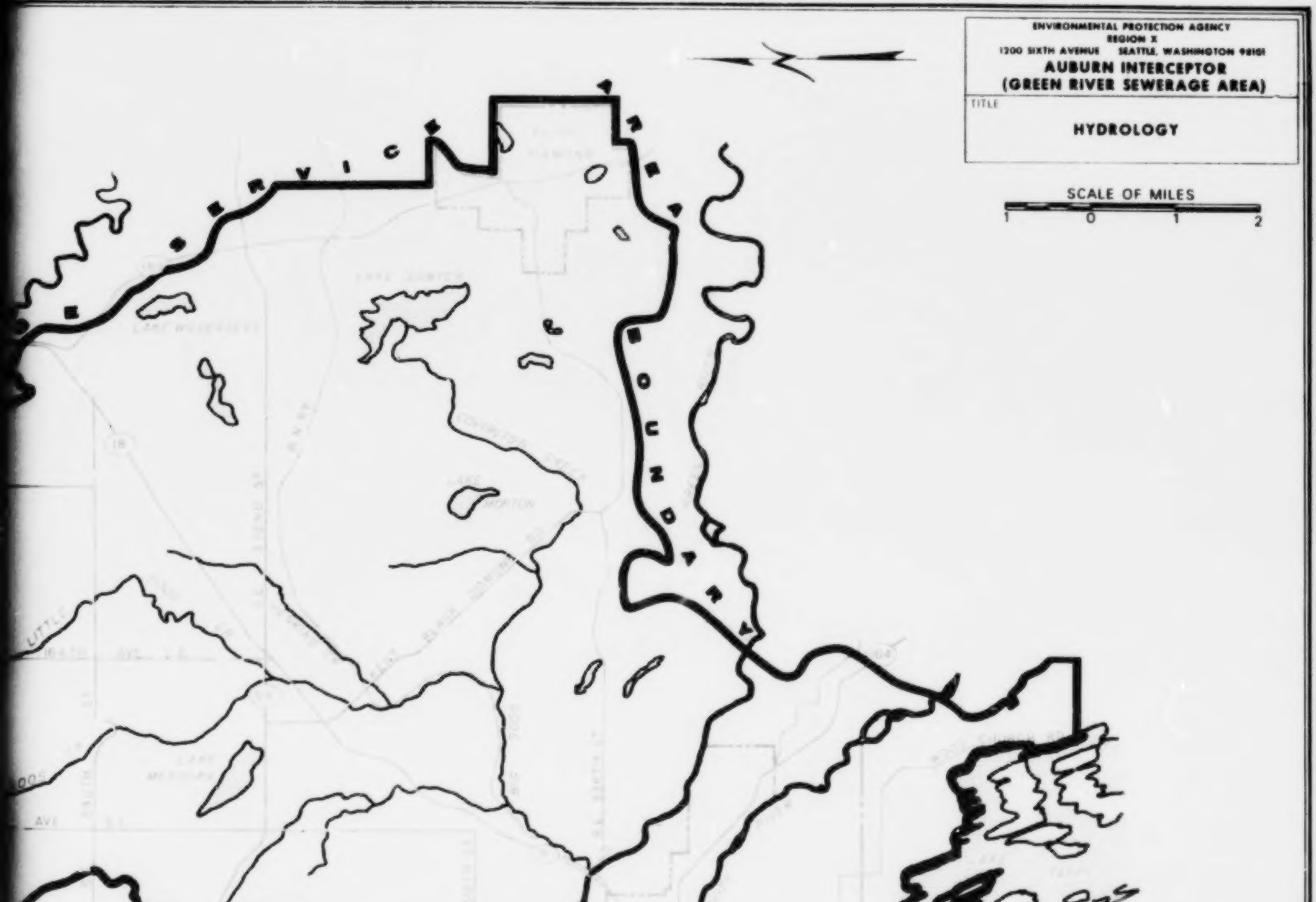
In 1906, a flood changed the course of the White River, diverting it into the Stuck and Puyallup Rivers. In 1915, a diversion dam permanently blocked the former channel. With reduced flow through the Green River valley, farming became more feasible on the valley floor. To extend the growing season, farmers constructed low dikes along the Green River. This allowed farmers to work their fields for a longer season, but did not protect against major winter floods.

In 1962 Howard A. Hanson Dam was constructed on the Green River about 30 miles upstream from Auburn. Major floodflows were reduced to the maximum capacity of the river channel within its existing dikes. Historically, floods have swept the low-lying lands of the Green River valley; now, they are protected by upstream dam regulation and a system of levees that constrict the Green as it passes through the valley below Auburn. At Auburn, for example, flood flows are now limited to less than 12,000 cfs (100 year flood).[1] The peak flows that are permissible still pose a problem to these lands. Although they no longer lie in the direct flood zone and in the path of high-velocity flood waters, severe ponding occurs in some areas during high water. Levees have allowed a broader range of land uses and more productive farming. The system has also made discharge from the Black River and Mill Creek impossible during peak flows unless aided by lift stations as has been necessary on the Black River and as proposed for Mill Creek.[2] Because of the continued hazard from highwaters in the fringe areas under flood conditions, construction in a substantial portion of the sewerage area with regulations for


SEWERAGE SERVICE AREA
BOUND
LAKE WILDERNESS
LAKE MORTON
COVINGTON CREEK
196TH AVE SE
SPRING LAKE
DESIRE LAKE
LAKE YOUNGS
LITTLE SOOS CR
JENKINS CR
BIG SOOS CREEK
LAKE MERIDIAN
140TH AVE SE
132ND AVE SE
SE 128TH ST
CEDAR RIVER
PETROVITSKY ROAD
RENTON
TUKWILA
KENT
AUBURN
Renton Sewage Treatment Plant
Auburn Sewage Lagoon
Kent-Highlands Solid Waste Landfill

6

FIGURE 2


ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101
AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)
TITLE
HYDROLOGY
SCALE OF MILES
1
0
1
2
SERVICE AREA BOUNDARY
AUBURN
Auburn Sewage Lagoon
Kent-Highlands Solid Waste Landfill

24.

b

designated flood hazard areas. Because of flood control and other measures, the Green River valley is now largely an artificially-altered flood plain. Future projects are also planned. See Appendix E for information concerning the SCS Drainage project and the Army Corps of Engineers Flood Control Study.

GROUNDWATER

The geology and groundwater resources of Southwestern King County have been described by Luzier.[3] In general, the tertiary rocks that underlie the area have low permeability and are not important aquifers for storing or transmitting groundwater. This condition results in little or no appreciable movement of groundwater from the Cascade Mountains to the Green River valley.

Groundwater in the valley below Auburn is derived chiefly from precipitation on the valley floor and on the adjacent Des Moines and Covington Uplands. These uplands are composed chiefly of unconsolidated glacial and glacial-fluvial deposits and have the capacity of absorbing and transmitting large volumes of water.

Groundwater beneath these uplands is recharged or replenished by precipitation during the wet winter months, moving west from the Covington Uplands and east from the Des Moines Upland. It discharges directly into the Green River, its tributaries, and the flood plain. The discharge of groundwater to the Green River valley has helped create wetland areas in some parts of the valley.

Groundwater resources of the Green River valley are used for private and municipal water supplies. Shallow wells generally yield adequate domestic supplies, and deeper wells may produce very large quantities of water, depending on the coarseness of the sands and gravels.

The entire alluvial Green River valley bottom functions as an aquifer, replenishing the water supply of Auburn, as well as the many small water supply systems, such as those adjacent to the Auburn Interceptor's proposed corridor. For Auburn, two wells in the valley yield 3 and 4 mgd, but a major portion of Auburn's supply comes from Coal Creek Springs (6½ mgd) which is south of the White River. West Hill Springs, due west of 15th St. N.W., is a minor contributor to the supply (½ to 3/4 mgd). Although the City of Kent also relies on groundwater, the major sources are springs, located east of town on the plateau. Renton obtains the majority of its municipal water supply from wells near the Cedar River and a spring east of the city. About one-tenth of its supply is obtained from the City of Seattle.

Within the Green River valley, groundwater is, in general, of excellent quality. Some wells do exhibit high chloride concentrations from residual water trapped thousands of years ago in the alluvial soils that settled in the valley. High iron concentrations and natural gas odors in some well water may be due to some natural peat and peaty sediments.[1]

GREEN RIVER AND DUWAMISH RIVER

The Green River rises in the steep, forested valleys of the western slope of the Cascade Mountain range in King County and flows about 80 miles northwest to the town of Tukwila in the glacial valley, south of Seattle. There, it becomes the Duwamish River and continues for another 11 miles through a heavily industrialized area to the river mouth at Elliott Bay on Puget Sound. The total drainage area of the river above Tukwila is 483 square miles.[4] The Howard A. Hanson Dam, operated by the Corps of Engineers, is located about 53 miles upstream of Tukwila and forms a flood control and conservation reservoir of 106,000 acre-feet active capacity. Downstream of the dam, the 15-mile long, rugged Green River Gorge contains a major diversion structure for the City of Tacoma water supply with a capacity of 113 cubic feet per second (cfs). The main tributaries to the Green River downstream from the dam are Newaukum Creek and the Big Soos Creek. The Duwamish receives waters from the Green and the Black River near Tukwila.

USES

Water resources in the Green River area are used primarily for municipal and industrial water supply, recreation and aesthetics, irrigation, fisheries, and wildlife. Downstream, the Duwamish is used for navigation in the industrialized lower estuary. The largest consumptive uses are for municipal and industrial water supply. Although the City of Tacoma water supply is from a surface source, the Green River, most of the smaller independent systems rely on groundwater supplies.[5]

Because of high annual rainfall, irrigation is generally used to prevent crop failure and maintain growth during the dry spells rather than to provide total growing season moisture requirements. Instream water uses include recreational fishing, boating, and water-contact sports, as well as anadromous and residential fish propagation. In the Green River, important anadromous fish are chinook, coho, chum salmon and steelhead, while resident species include rainbow and cutthroat trout. Valuable spawning grounds are located in the main stem of the river between Kent and the Tacoma diversion structure, and in Newaukum and Big Soos Creeks[6] (see Fisheries section). The Washington Department of Fisheries operates a hatchery for coho and chinook salmon on Big Soos Creek about two miles above its confluence with the Green River.

FLOWS

The highest flows in the Green River usually result from winter rains with lower peaks in April and May due to the snowmelt and spring rains. Low flow conditions prevail from July through September (see Figure 3).[14] Where the river enters the broad floodplain at Auburn, the mean annual discharge is 1,345 cfs.

The 100-year flood, as now controlled by the Howard Hanson Dam, is about 12,000 cfs at Auburn. Reservoir releases during summer months provide a minimum flow of 110 cfs downstream from the Tacoma water supply diversion in accordance with an existing agreement with the State Department of Fisheries. Inflow downstream from this point increases the minimum flow so that a low flow of about 145 cfs at Auburn would be expected only about once in ten years.

WATER QUALITY PROBLEMS

Existing water quality in the Duwamish-Green River drainage system ranges from excellent in the upper reaches to relatively poor in the Duwamish estuary. In the vicinity of Kent and Auburn, dissolved oxygen, temperature, nutrients, and bacteria have been of concern.

Temperature. On the average, State water quality standards are violated once in two years at Auburn and Tukwila during the summer months. Low streamflows during months having long hours of sunshine and a lack of adequate shading appear to be the cause.[6] Annually in July and August, the surface waters of the Duwamish estuary violate temperature standards.

Dissolved Oxygen. Standards were violated at Tukwila (RM 12.1) at least once every two years (during 1964-1971).[6] Diurnal variations at this station may still result in violations. Benthic oxygen demands and lowered saturation concentrations of dissolved oxygen with higher water temperatures are among the causative factors, but biochemical oxygen demand from point discharges of wastewater does not

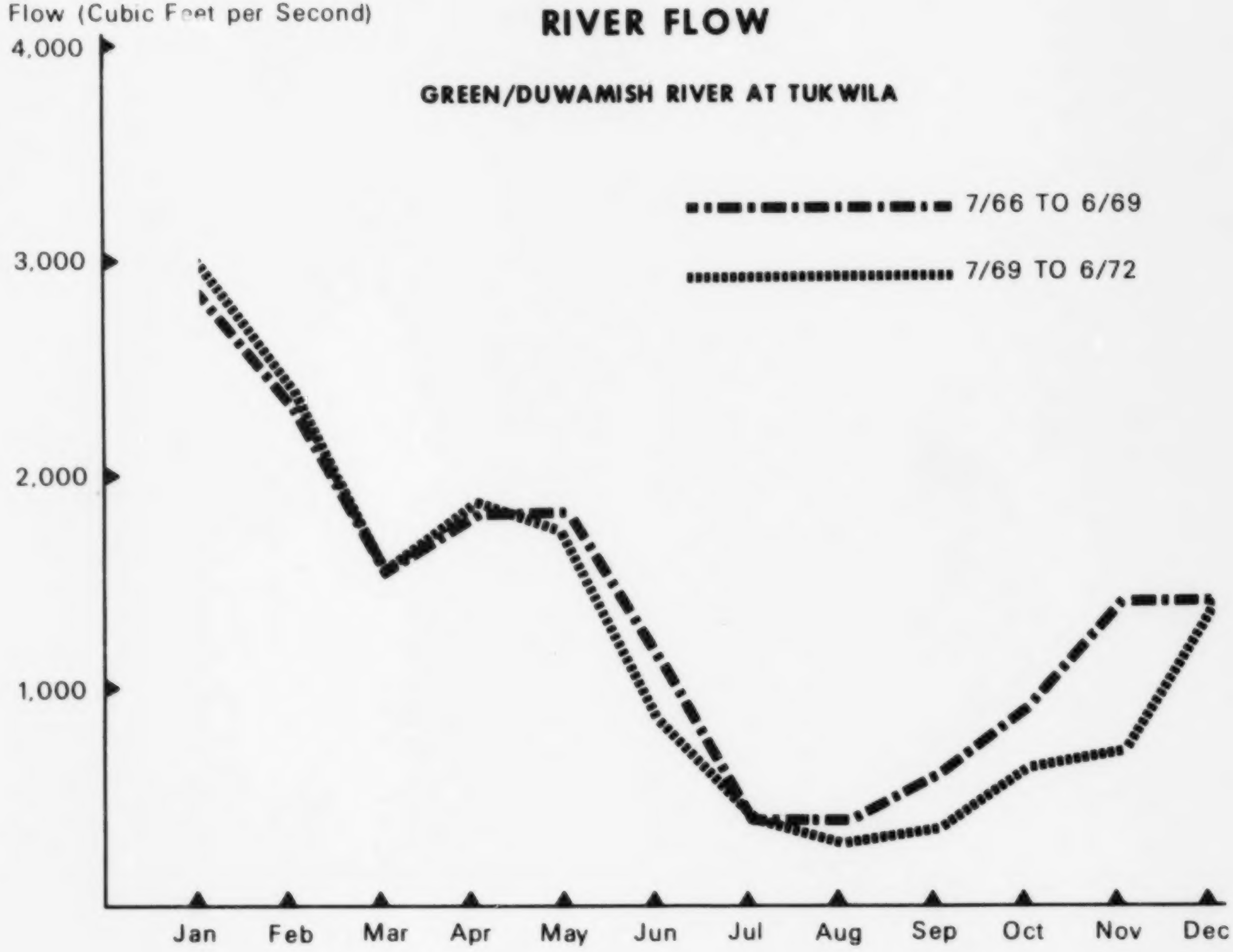

RIVER FLOW
GREEN/DUWAMISH RIVER AT TUKWILA
Flow (Cubic Feet per Second)
4,000
3,000
2,000
1,000
7/66 TO 6/69
7/69 TO 6/72
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

FIGURE 3

appear to be significant.[4] At the Kent-Des Moines Bridge (Metro's Station 315 - River Mile 21.85), dissolved oxygen concentrations also continue to be below the standard during low summer flow due to diurnal variations.[7]

TABLE 7. VIOLATIONS* OF STATE'S DISSOLVED OXYGEN STANDARD (8.0 mg/l) DURING AUGUST AND SEPTEMBER 1974 AT METRO STATION 315

Dissolved oxygen (milligrams/liter)

August	1	7.66	August	16	7.86
1974	2	7.66	1974	17	7.52
	3	7.50		22	7.72
	4	7.38		23	7.72
	5	7.36		24	7.74
	6	7.60		25	7.52
	7	7.83		26	7.50
	9	8.0		27	7.46
	10	7.58		28	7.26
	11	7.82		29	7.22
	14	7.92		30	7.48
				31	7.86
Sept.	4	7.96			
1974	6	8.0 and above			

---

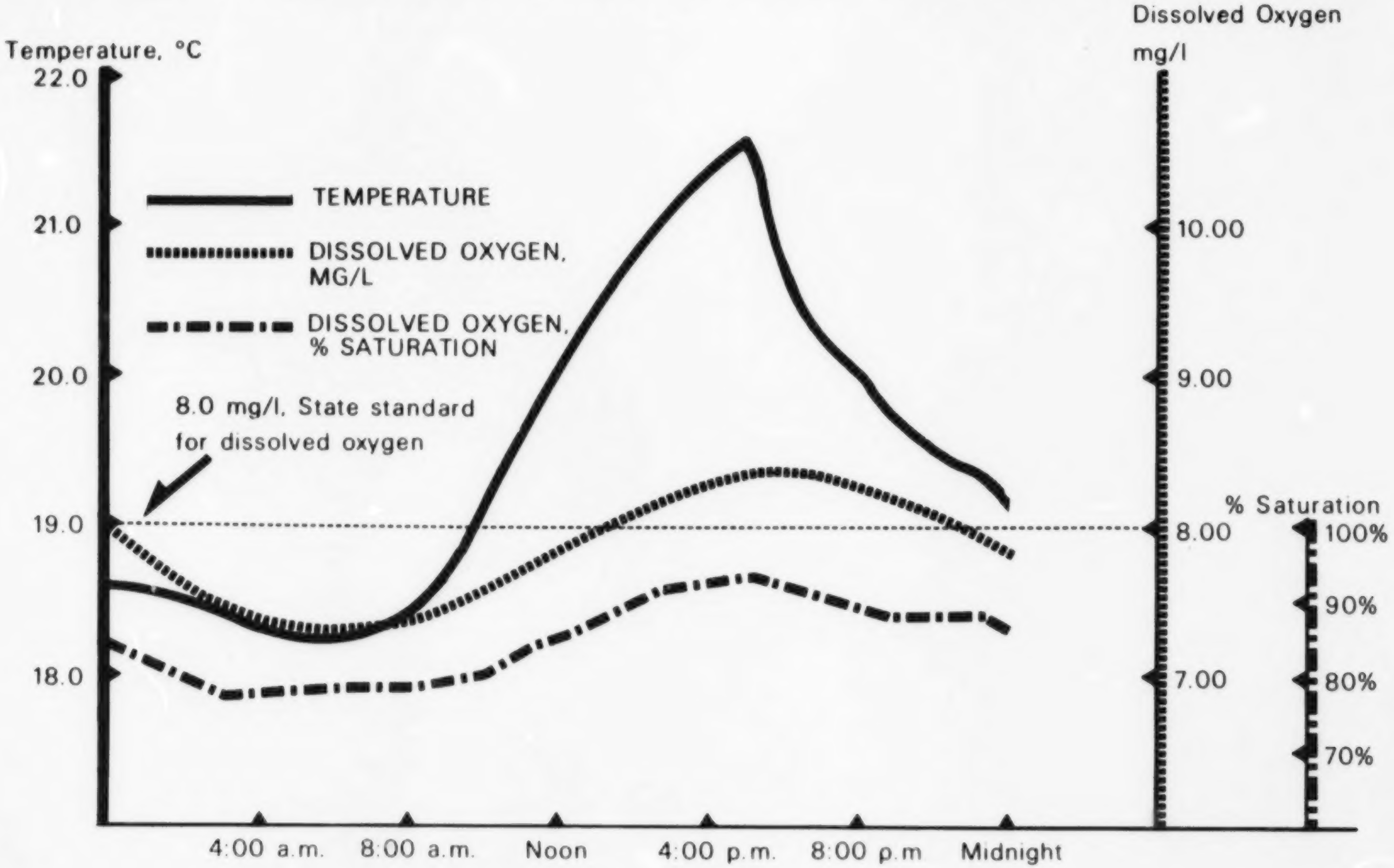
*Minimum observed value based on hourly measurements

Figure 4 shows the diurnal variation for August 28, 1974. In August and September 1974, the lowest dissolved oxygen observed at this station (River Mile 21.85) was 7.22 milligrams per liter (see Table 7) In the Duwamish estuary, dissolved oxygen concentrations violate the standards nearly all of the time during the summer in the saltwater wedge underlying the fresh water. At the bottom, in the salt wedge, concentrations as low as 3.6 milligrams per liter were recorded during very low summer flows in September 1974 at Metro's continuous monitoring station at 16th Avenue South.[8] In surface waters, decreases in dissolved oxygen following a summer bloom of phytoplankton may violate standards. The phytoplankton

30.

FIGURE 4

DIURNAL VARIATION OF DISSOLVED OXYGEN AND TEMPERATURE



August 28, 1974 METRO Station 315 Kent / Des-Moines Bridge

blooms appear to be related to low freshwater inflow. (The seasonal flow of the Green River at Tukwila is shown in Figure 3).

Bacteria. Total coliform standards are violated annually during most of the year.[6] Sources of contamination appear to originate upstream in the Green River system.

Nutrients. During any time of the year, nitrate-nitrogen at Tukwila may exceed the level considered to be critical for algal blooms (0.3 mg/l). Criteria are exceeded at Auburn only during months of high runoff, indicating non-point sources.[6] Nutrient levels are high enough to support algal growths. Upstream, algae are probably limited by light rather than nutrients and are limited in the Duwamish estuary by light plus the wash-out rate.[9] Nuisance aquatic growths have been observed downstream from the Kent-Highlands land fill site and are thought to be associated with this source.

Toxic Materials. Polychlorinated biphenyls (PCB) have been found in the Duwamish estuary in sufficiently high concentrations to warrant additional study. Concentrations of PCB's in zooplankton were greater than the criteria recommended by EPA. High concentrations were also noted in sediments. The major sources of PCB's have not been identified,[6] although in 1974, an accidental leak of transformer fluid discharged substantial quantities of PCB's. High concentrations were noted in the estuary before this spill.

Recent (1973) toxicity bioassays indicate that chlorinated effluent discharged from Metro's Renton sewage treatment plant can be acutely toxic to fingerling coho salmon at dilutions that may occur during one in ten year low flows in the Duwamish River. Total residual chlorine (which can be de-toxified by de-chlorination procedures) appears to be the toxicity factor. Additional studies to examine chlorine's chronic toxic effects are underway.[6] Dechlorination of the Renton effluent is now being performed to control excess chlorine discharge.

THE AUBURN SEWAGE TREATMENT LAGOON

The existing Auburn Sewage Treatment Plant discharges chlorinated effluent from a two stage stabilization and oxidation pond into the Lower Green River. The facility is located south of 30th Street Northwest and east of the Burlington Northern Railroad tracks. The treatment plant is composed of approximately 38 acres of lagoons preceded by a lift station and a grit removal facility; its lagoons are arranged in five cells. Raw waste enters the first two aerobic cells that contain floating aerators where it is held for an average of five days; it then flows to the final aerobic cells where the effluent is held for 20 to 25 days.[1]

PRESENT DISCHARGE

The annual average daily flow of sanitary sewage to the Auburn lagoon system presently approaches 1.9 million gallons per day (mgd). Peak daily flows during wet weather were less than 4.6 mgd during 1973 and 1974, but reached 7.0 mgd during February 1975. Instantaneous flow rates were less than 6.9 mgd during 1973 and 1974 but reached 12.5 mgd in February 1975.[10] The higher flows resulting from inflow and infiltration of storm water into the Auburn system remain a problem during the wet winter months.

On an annual average, the raw influent to the Auburn lagoon has an oxygen demand equivalent to a population of about 22,000 people. Lagoon treatment reduced the biochemical oxygen demand (BOD) by about 84% in 1974 and about 82% in 1973, on an annual average. The minimum treatment provided in 1974 and 1973 was about 67% for the monthly average reduction of BOD$_5$.

EPA's secondary treatment standards require that BOD and suspended solids are reduced by 85% (monthly average), and both reach concentrations of 30 mg/l (monthly average) and 45 mg/l (weekly average). Efficiency checks by the DOE conducted in August 1973, found that these standards were not met. Reductions in BOD$_5$ and suspended solids were 77% and 80%. Effluent concentrations were 36 mg/l for BOD$_5$ and 55 mg/l for suspended solids. Most suspended solids in the effluent are attributed to green algae.[1]

Although two additional aerators were installed in December 1973, subsequent data reported by the City of Auburn to the DOE have shown that EPA's secondary treatment standards are not consistently met. However, reductions of BOD$_5$ exceeded 85% during seven of the twelve months in 1974, and during five months in 1973 (see Figure 5). Monthly average concentrations of BOD$_5$ were less than the standard of 30 mg/l during nine months of 1974, and during four months of 1973. Suspended solids reductions are not routinely measured, but data collected by Metro during the fall and winter of 1974 and early 1975 showed that secondary standards for suspended solids are seldom achieved by the Auburn lagoon. Suspended solids were consistent with the secondary standard in one of five months in late 1974 - early 1975.

AUBURN LAGOON - FLOWS AND BOD$_5$ REMOVAL
(1973 & 1974)

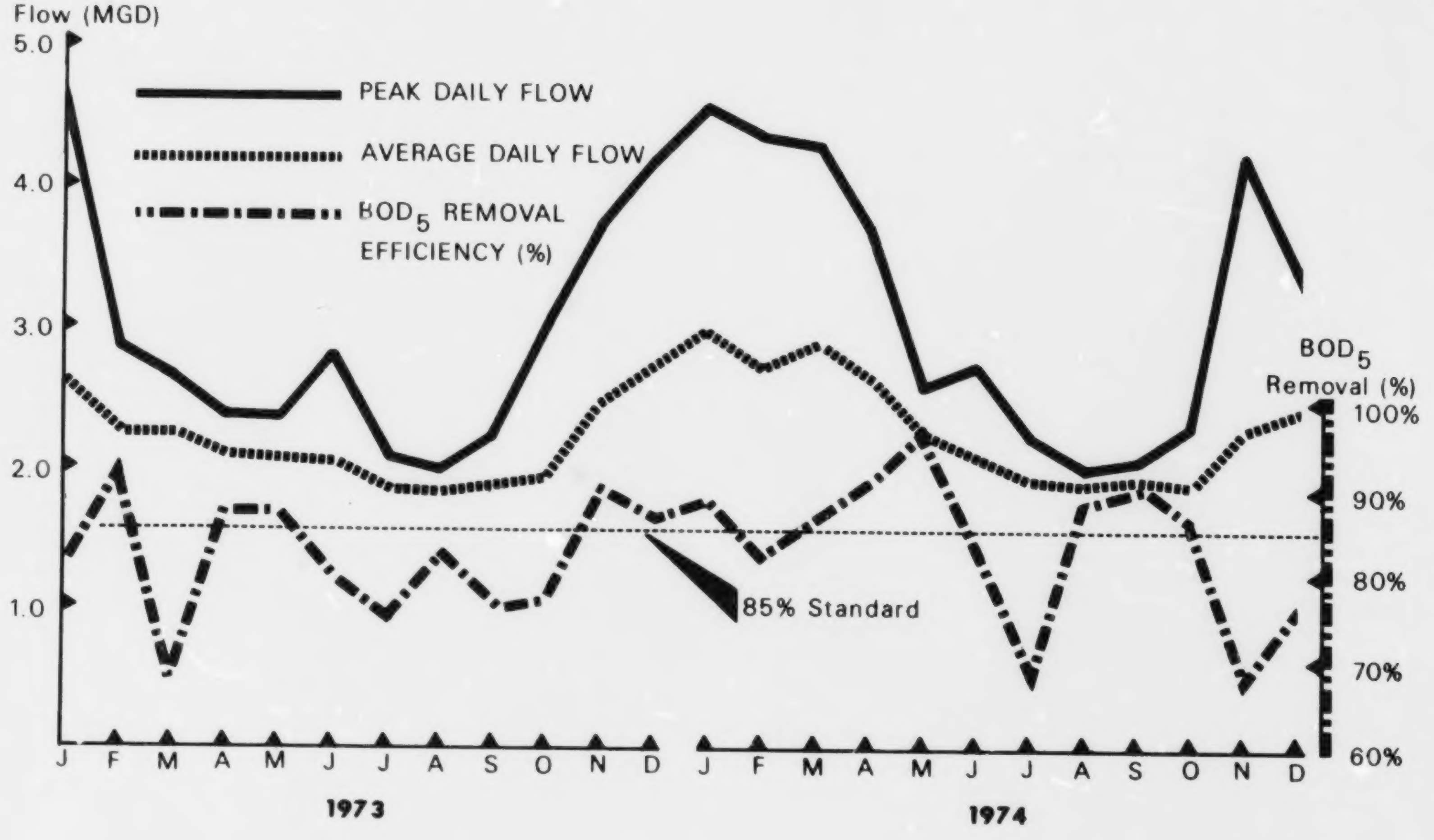


FIGURE 5

The lagoon does appear to be meeting the secondary treatment criteria for bacteria and pH. EPA requirements for secondary treatment are shown in Table 8.

TABLE 8. NUMERICAL CRITERIA FOR SECONDARY TREATMENT

Units of Measurement	Monthly Average	Weekly Average
BOD (5 day) mg/l	30	45
Suspended Solids	30	45
Fecal Coliform Bacteria number/100 ml	200	400
pH	Within limits of 6.0 to 9.0	

In accordance with Section 301(b)(1)(B) of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), compliance with the above level of treatment is to be achieved for all publicly owned treatment works by July 1, 1977. It is generally recognized that neither standard oxidation lagoons nor aerated lagoons by themselves will be able to achieve the required level of treatment.

EFFECTS OF THE AUBURN LAGOON ON WATER QUALITY

The Green River, approximately six miles downstream of the discharge of the City of Auburn, has experienced dissolved oxygen depressions below the minimum applicable standard (8.0 mg/l) on numerous occasions since July 1969.[1] Data reported by Metro for the summer of 1974 for this sampling station were also below the standards (see Table 1). These data do not indicate a continuing violation of water quality standards, but do indicate that the Green River only marginally meets the applicable standard.

In November, 1972, the DOE expressed its belief that the City of Auburn in combination with other waste sources, contributes to this depressed oxygen condition in the Lower Green River. DOE anticipates that a low-flow year combined with an imbalance in the Auburn lagoon could lead to severe violations of water quality standards downstream.[11]

RIBCO studies, however, have concluded that a variety of factors appear to be causing the violations of dissolved oxygen observed further downstream at Tukwila. Both benthic organisms and higher downstream temperatures may significantly contribute to the decreased level of dissolved oxygen. Point discharges of wastewater were not thought to be significant.[4]

The DOE suspects the nutrient load discharged by the Auburn lagoon into the Green River may contribute to the dissolved oxygen depressions downstream. However, DOE surveys of the Green River below the lagoon's outfall have found no chemical or biological damage attributable to the lagoon. One adverse impact on present water quality, possibly associated with the Auburn lagoon's nutrient load, may be aesthetic; stimulated biologic activity in the Green River during late summer often creates excessive algae growths and nuisance slime conditions. However, the principal location of these excessive nuisance slimes is immediately downstream from the Kent - Highlands Landfill, which is thought to be the major cause of these growths.

At the present levels of discharge, no significant degradation of water quality in the Green River directly attributable to the lagoon effluent can be discerned. However, many other identifiable pollution sources do exist in the area. For example, major sources of typically high coliform counts within the Lower Green River appear to be upstream dairy farms and manure sprayfields. Wastes from the State Salmon Hatchery on Big Soos Creek and a fish hatchery near Palmer contribute to the nutrient load within the Green River, and meat packing operations in the sewerage area have added very high BOD and coliform loads in the past. Many portions of the sewerage area experience problems directly related to improperly sized, sited, and/or maintained septic tanks.[1] Urban drainage may also contribute to localized water quality problems.[1] Leachate and contaminated stormwater from the Kent-Highlands landfill (solid waste disposal site) are measurably degrading water quality of the Green River and a creek adjacent to the site.[5] The treatment facility effluents and other discharges from the landfill site do not meet the federal requirements for secondary treatment and also exceed maximum concentrations specified for some heavy metals by DOE guidelines on effluents from sanitrry landfills.[5]

TRIBUTARIES TO THE GREEN RIVER

The smaller streams and creeks within the Green River sewerage area vary in their existing quality. Most are used by anadromous fish. The waters of the major tributaries, Newaukum Creek, Crisp Creek, and Big Soos Creek are satisfactory for fish passage, but would not be considered acceptable for water contact sports or human consumption due to high concentrations of total coliform bacteria.[12]

NEWAUKUM AND CRISP CREEKS

Water in these tributaries, which are upstream from the sewerage area, is generally of poorer quality than the Green River just upstream. Although Newaukum and Crisp Creeks are of sufficient quality to be adequate for fish passage and not detrimental to other aquatic life, both exhibit unusually high coliform concentrations in violation of Class A standards. High bacteria, solids, and turbidity can be attributed to surface runoff from this agricultural area which contains numerous dairy farms. Nutrients were generally at higher than desirable levels. Dissolved oxygen levels were also high. Based upon computer simulation, Newaukum Creek presently significantly impacts the Green River. Nearly 10% of the BOD and ortho-phosphate, one-third of the ammonia, and approximately one-half of the nitrate and coliform mass discharges of the Green River above the confluence with Big Soos Creek can be attributed to Newaukum Creek.[6]

SOOS CREEK DRAINAGE SYSTEM

Although the general water quality in the Soos Creek drainage system is acceptable, bacterial contamination results in violations of the State Class A coliform standards at most stations (Soos Creek, West Branch Soos Creek, and Little and Big Soos Creek).[12] Jenkins and Covington Creeks are the exceptions. The Soos Creek system is one of the most contaminated as far as sanitary conditions are concerned.[12]

Based on computer simulations, Big Soos Creek significantly contributes to the mass discharge of nitrate in the Green River at Tukwila.[6]

LAKES

The many lakes in the Green River sewerage area vary greatly in their water quality conditions. Where problems have been identified, they relate to bacterial contamination or eutrophication. Lakes naturally undergo an aging process (eutrophication), gradually filling with organic matter from biological growth and sediment carried by inflowing streams. During the aging process, which may normally take thousands of years, the originally clear, pristine lakes fill with algae and water plants, and eventually become swamps and meadows. Lakes become less desirable for swimming and boating as they become more eutrophic and aged. The more desirable species of game fish may disappear and the diversity of aquatic life forms tends to diminish. On the other hand, amphibious life, water-dependent animals like raccoons, beaver, and muskrat, and a variety of insects and birds will be attracted by the plant growth and abundance of nutrients. The lake will become more attractive for natural observation.[4]

Although the aging of lakes is a natural process, it can be greatly accelerated by artificial increases in nutrient inflow which provide food for the algae. Phosphorus and nitrogen, the most important nutrients, are contained in sewage effluent, in runoff from streets, lawns, cropland, and livestock.

Many of the lakes in the Green River Sewerage Area exhibit poor sanitary conditions and/or high nutrient levels during some period of the year. A study conducted in 1971-1972 concluded that four of the lakes (Jones, Bass, Moneysmith, and Dolloff) were in such advanced stages of eutrophication that attempts to reduce nutrient inputs could not be recommended.[12] Two lakes (Wilderness and Star) were recommended for further study. Reductions in nutrient inputs were recommended for the nine remaining lakes in this area (Meridian, Deep, No. 12, Retreat, Morton, Sawyer, Lucerne, Pipe, and Shadow).

Excessive bacterial concentrations have been found in several of the lakes during the summer. Jones and Bass Lakes were somewhat worse in this respect than Sawyer, Morton, Meridian and Dolloff Lakes during the 1971-1972 study.

Leachate from septic tanks has been suspected as a source of both nutrients and bacteria in the lakes of the study area; however, no data on the magnitude of these potential contributions are available. Health authorities suspect that Jones Lake may be affected by septic tank drainage from Black Diamond. Metro noted that one lake, Star, may be affected by highway drainage.

WATER QUALITY STANDARDS

The applicable water quality standards are the Washington State Standards adopted June 19, 1973 (WAC-173-201-010 thru 173-201-170) (see Appendix A). Under these standards each water body is classified (Lake, AA, A, B, etc.) and beneficial uses to be protected are designated for each class. Specific numerical criteria have been established for some parameters (see Appendix). Characteristic uses to be protected for Class AA and Class A streams include but are not limited to water supply (domestic, industrial, agricultural); wildlife habitat; stock watering; general recreation and aesthetic enjoyment (picnicking, hiking, fishing, swimming, skiing, and boating) and fish and shellfish reproduction; rearing and harvest; and commerce and navigation. Similar uses are protected for Class B water with the exceptions of salmonid fish spawning, water contact recreation, and domestic (drinking) water supply. Consequently Class B waters may have higher bacterial counts, temperatures and turbidity and lower dissolved oxygen concentrations than Class A waters.

The classifications which apply to the Green-Duwamish River system are shown in Table 9.

TABLE 9. DOE WATER QUALITY CLASSIFICATIONS[13]

Water	Description	Class	Comment
Green River	Headwaters to West boundary of Sec. 13, R7E, T21N	AA	No wastes may be discharged in this reach.
Green River	West boundary of Sec. 27, R6E, T21N to West Boundary of Sec. 13, R7E, T21N	AA	
Green River	Beg. to West boundary of Sec. 13, R7E, T21N	A	Area of Auburn STP discharge.
Duwamish	Upstream from the confluence with the Black River to the limit of tidal influence	A	Special condition for total coliform-less than 1000 organisms/ 100 milliliters with less than 20% of samples exceeding 2,400 when associated with any fecal source (Area of Renton Sewage Treatment Plant Discharge)
Duwamish	From mouth South of a line bearing 254° true from the NW corner of Berth 3, Terminal No. 37 to the confluence with the Black River	B	
Tributaries	In the Green River Sewerage Area	A	
Lakes	In the Green River Sewerage Area	Lake	
Feeder Streams to Lakes		AA	

REFERENCES

1 Auburn Interceptor EIS, Metro, January 1974.

2 Draft Copy, Final Report: Urban Runoff and Basin Drainage Study - Green and Cedar River Basins of Washington, U. S. Army Corps of Engineers, Seattle District, July 1974. (for RIBCO).

3 Luzier, J. E., Geology and Groundwater Resources of Southwestern King County, Washington, U. S. G. S. Water Supply Bulletin No. 28, Department of Water Resources, Olympia, Washington, 1969.

4 Final Draft, Water Quality Management Study, Main Report, RIBCO, (Stevens, Thompson, and Runyan, Inc. - Consultants), August 1974. (For RIBCO).

5 Final Alternatives, Conclusions and Recommendations, RIBCO Water Quality Management Study, (Stevens, Thompson, and Runyan, Inc. - Consultants), March 1974.

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7 Personal Communication, Cecil Whitmore, Metro, March 1975.

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9 Personal Communication, M. Harper, Stevens, Thomspon and Runyan, Inc. (RIBCO Consultants). March 1975.

10 Personal Communication, Everett Efflund, City of Auburn, March 1975.

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12 Quality of Local Lakes and Streams, Metro, December 1973.

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14 U.S.E.P.A., Puget Sound 305 - A Report, EPA 910/7-74-001, Surveillance and Analysis Division, EPA, Region X, Seattle, Washington. October 1974

EXISTING AIR QUALITY

The 1970 amendments to the Clean Air Act (CAA) directed EPA to set primary and secondary national ambient air quality standards for the major air pollutants. The standards were to establish the maximum permissible level for each pollutant. The primary standards were to be strict enough to protect public health; secondary standards were to be strict enough to protect the public welfare. Each State was then directed to formulate an implementation plan which would assure that the standards would be attained and maintained and properly enforced. EPA approved most of the implementation plans in 1972, but was later directed by the courts to examine the plans again and to disapprove those which did not have sufficient mechanisms to assure that the standards would be maintained once met. Pursuant to this court order, EPA directed States to identify those areas which, due to current air quality and/or projected emission source growth rate, were not expected to attain and/or maintain a national standard by 1985. These areas are known as Air Quality Maintenance Areas (AQMA).

In the State of Washington, the Seattle-Tacoma area, as defined by the Washington State Department of Highways, is such an area.[1] Based upon both EPA and Washington Department of Ecology calculations, the only pollutant expected to violate the standards is the total suspended particulate (TSP).

It has been pointed out by the PSAPCA that the Agency's station at Kent has recorded violations of the photochemical oxidant standard. Indeed there may also be violations of ambient standards in the Kent-Auburn Valley for some other pollutants which are not currently monitored. The initial steps in the air quality maintenance planning process, developed by the Washington DOE, examined the need for maintenance strategies for all pollutants in the Puget Sound Region. While there may currently be violations of standards for several pollutants, it was determined that currently identified controls (such as the Puget Sound Transportation Control Plan) would be sufficient to attain such standards by the statutory deadlines and to maintain the standards thereafter.

At the same time, EPA recognizes that current techniques for determining ambient air levels and trends and the effects of anticipated emission controls on such levels and trends is not foolproof. Thus we are in a continuing process of evaluating the ambient levels for all pollutants and examining the results of regulatory emission control strategies. If such review indicates the need for more stringent emission control plans, EPA will require a revision in the Washington State Implementation Plan or require the development of a maintenance plan for the subject pollutant.

The State must now develop a program which will prevent violations of the TSP standards through 1985. The Puget Sound Council of Governments will be working with the Puget Sound Air Pollution Control Agency and the Washington Department of Ecology to develop this program in response to the CAA requirement that national ambient air quality standards be maintained once attained. The portions of the implementation plan designed to assure attainment of standards are being re-examined and will be revised accordingly if necessary.

Since the Auburn Interceptor Service Area is included in the Seattle-Tacoma AQMA, a detailed examination of the impact of expected growth in the service area on the TSP levels in the AQMA is needed. Air quality monitors located in the vicinity of Auburn are used to assess the current air quality in this area. One, located near the city center of Auburn, indicates air quality in the urbanized area. The other, located at the Green River Fish Hatchery about three miles east of downtown Auburn, is an indicator of background air quality for the immediate area since at this location there is a minimum of human activity and other localized sources of particulate matter.

The data from the Auburn monitor are shown in Table 10. The data for 1973, the base year selected for analysis, show an air quality level of 63 $\mu g/m^3$, annual geometric mean, as compared to the secondary standard of 60 $\mu g/m^3$. The 1973 data from the fish hatchery indicates a background concentration in the area of 28 $\mu g/m^3$.

The "background concentration" of 28 $\mu g//m^3$ annual geometric mean, at the Green River Fish Hatchery, does not conform to the strict definition of the term since there is probably some contribution to this concentration from other than natural sources. A true natural background is probably better represented by those values found at the Tolt River monitoring station where an annual geometric mean of 13 $\mu g/m^3$ was recorded in 1973. The difference between this natural background and this apparent urban background around the Auburn area is due to the increased human activity. Although the emission inventory accounts for most of the emissions resulting from this human activity, the inventory and emission estimating procedure is not detailed or sophisticated enough to account for all sources contributing to the urban concentrations thereby resulting in an urban background which is elevated above the natural background and not accounted for by the emission inventory. In using the Fish Hatchery data as such an "urban background" the assumption is made that the contributions to this value from identifiable emissions from the surrounding area are not significant. It is not known if this assumption is completely valid but because of its proximity to the Auburn area, the Fish Hatchery data should be a representative station for determining the urban background.

TABLE 10. TSP AIR QUALITY DATA FOR THE AUBURN MONITORING SITE

Year	Geometric Mean μg/m3	Arithmetic Mean μg/m3	Standard Geometric Deviation	Standard Arithmetic Deviation μg/m3	Maximum μg/m3	Number of Days Exceeding 150 μg/m3
1971	52	57	1.52	23.96	122	0
1972	55	62	1.62	35.03	257	2
1973	63	68	1.52	26.35	120	0
1974	51	57	1.63	27.41	136	0

Meteorological influences on the air quality in the service area differ somewhat from those in the general Seattle and Tacoma area. Since the Green River valley is an interior valley, one would expect a higher frequency of light winds and low level inversions than in an area adjacent to Puget Sound. Data obtained by Puget Sound Air Pollution Control Authority (PSAPCA) at their recently-installed wind station in Kent seems to confirm these expectations on wind speed. A six-month wind rose for the latter half of 1974 indicates that 49% of the winds during that period can be classified as light and variable (less than about 1.5 knots).[2]

The probable low wind speeds in the area, high frequency of low level inversions, and the constraining effects of the valley walls tend to trap locally-generated emissions. This results in poorer air quality than in areas adjacent to Puget Sound having the same emission density. Examination of the 1973 TSP patterns in the Puget Sound area (Figure B-4, Appendix B) seems to confirm that the lower emission density in the Auburn area results in the same air quality as many other areas in Seattle and Tacoma with higher emission source densities.

REFERENCES

1 Washington State Department of Highways, Planning Division, "Urban Areas In Washington", 1972.

2 Puget Sound Air Pollution Control Agency, Letter, February 24, 1975, from A. L. Kellogg (PSAPCA) to Dean Wilson (EPA).

EXISTING NATURAL VEGETATION, WILDLIFE, AND FISHERIES

The Green River Sewerage Area contains richly diverse natural vegetation, wildlife, and fisheries. There are several urban and rural communities, as well as large areas of relatively natural habitat. Many rivers and streams in the area support spawning populations of anadromous and non-anadromous fish.

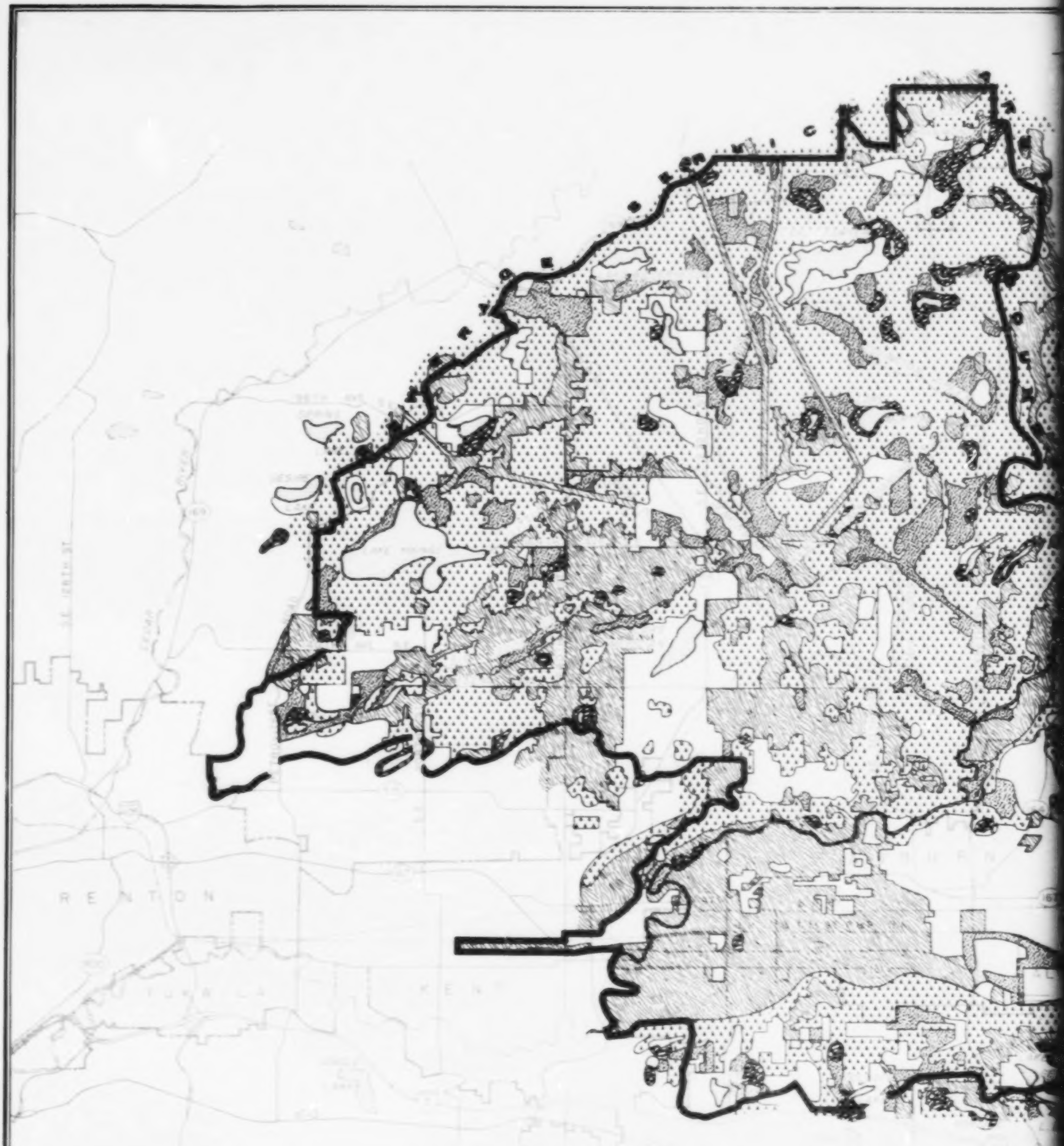
HABITATS

The study area falls within the Humid Transitional Life Zone which extends from sea level to about 3,000 feet in elevation. In the Green River valley permanent and seasonal wetlands are the most important habitats. On the surrounding plateaus -- the Des Moines, Black Diamond and Enumclaw Plateaus -- the dominant habitat is a mixed (coniferous-deciduous) forest. Deciduous forests, brushlands and wetlands are also found on the plateaus. Some rare and endangered species are found within the study area.

Terrestrial plant communities are shown in Figure 6. The map shows developed land, open areas (pastures and fields), brushlands and saplings (which includes early successional forests), woodlands (mixed forests and deciduous forests) and some permanent wetlands. On this map, most of the wetlands are included in the category appropriate to their vegetation type -- open areas, shrubs or wooded. Location of the wetlands is shown in Figure 7. Rare and endangered species which might occur in the study area are listed in Table 11. A list of representative species in the study area is included to show the great diversity of flora and fauna represented (see Appendix D).

WETLANDS

Wetlands (see Figure 7), which comprise approximately 8,100 acres, are of particular significance. They are important habitat for many plants and animals and valuable water resources . In the Green River valley, wetlands cover large areas of the flood plain. On the surrounding plateaus, wetlands are smaller, more isolated areas generally associated with lake basins, depressions and stream water, and by vegetation.[1] Not all wetlands types are represented within the study area. Many of the wetlands within the study area were not classified by type since insufficient time was available for adequately identifying vegetation and determining seasonality and depth of inundation. Wetlands in the study area are:


RENTON
TUKWILA
KENT
169

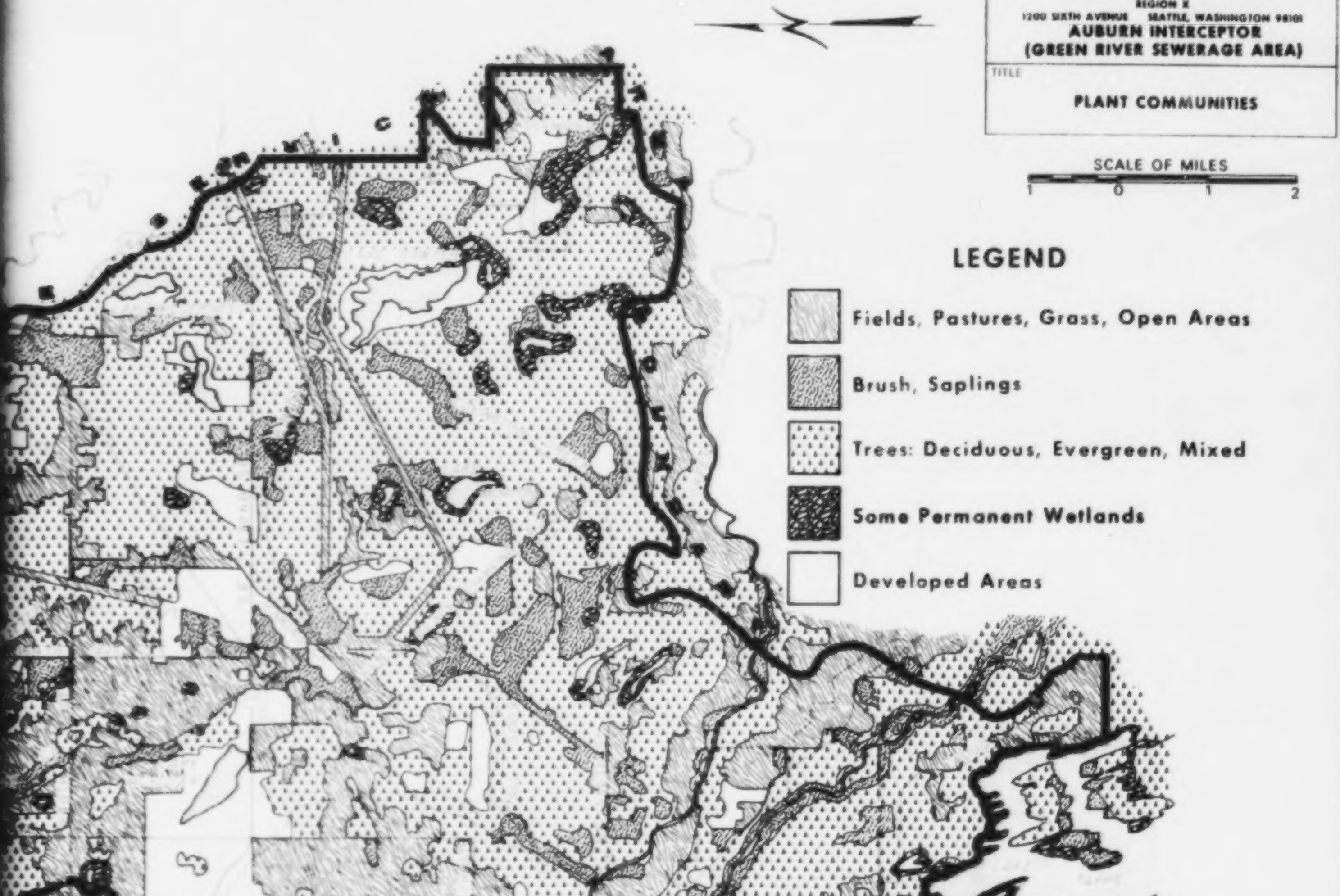
a

FIGURE 6

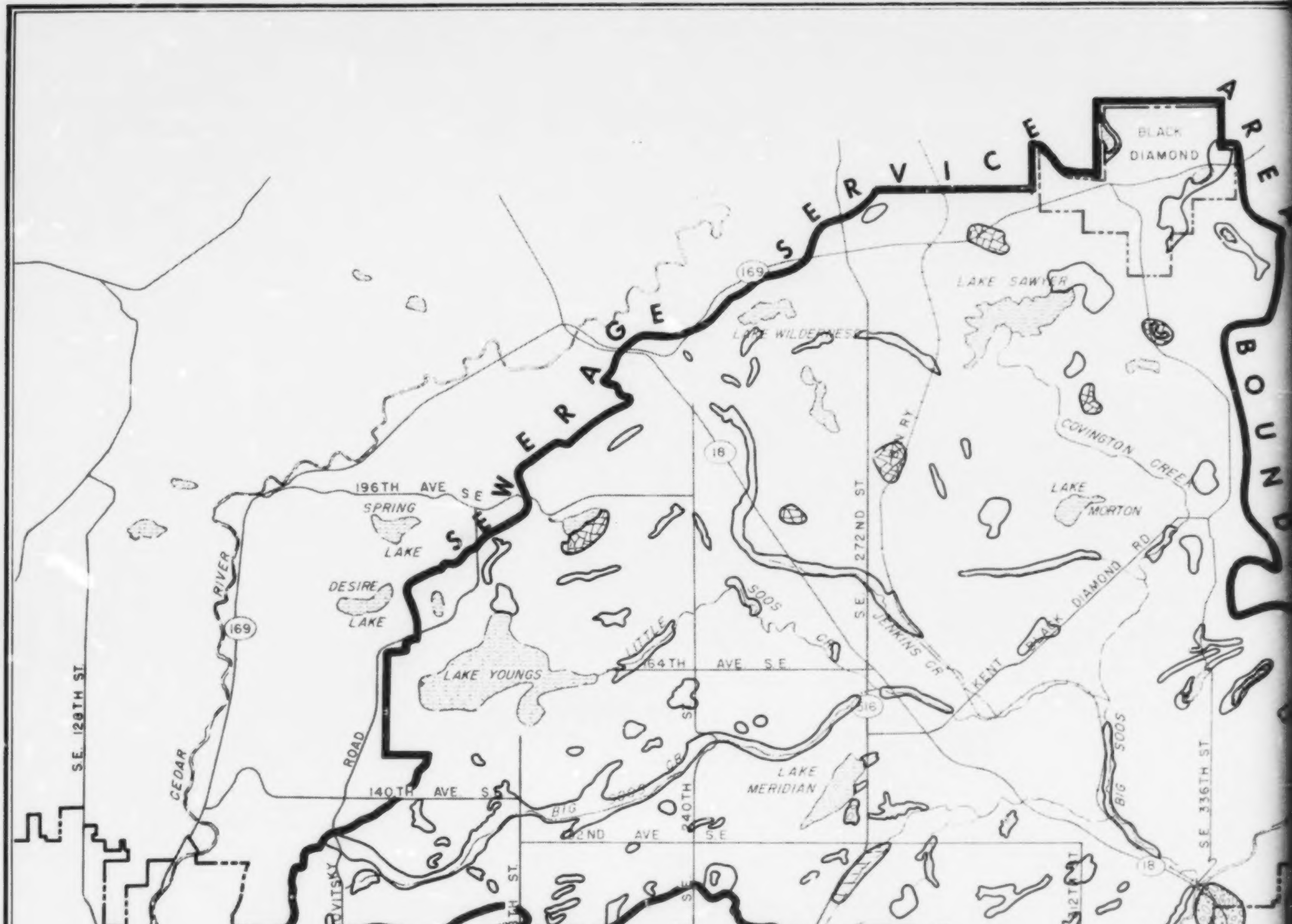
ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101
AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

PLANT COMMUNITIES

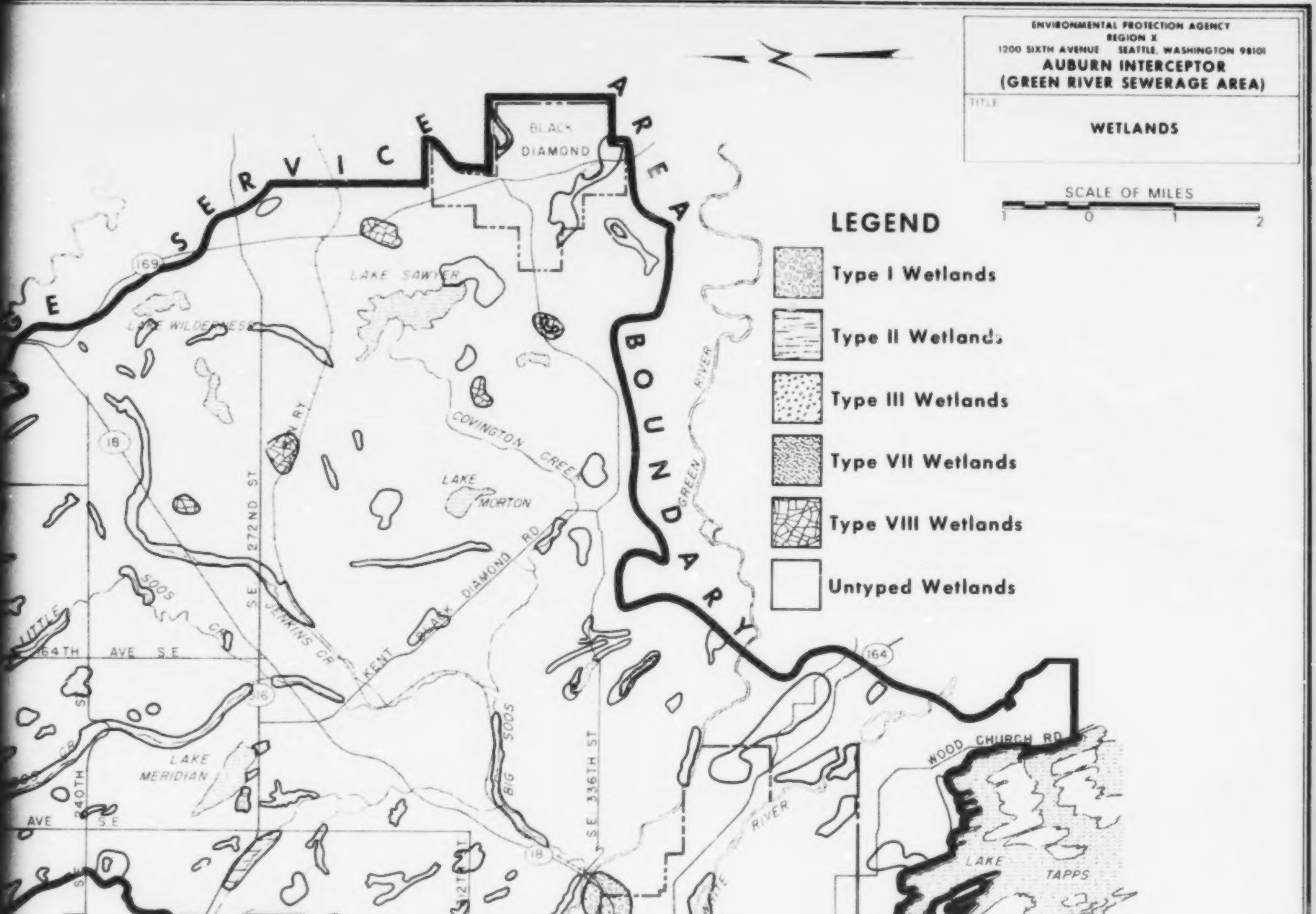

N
SCALE OF MILES
1
0
1
2
LEGEND
Fields, Pastures, Grass, Open Areas
Brush, Saplings
Trees: Deciduous, Evergreen, Mixed
Some Permanent Wetlands
Developed Areas

THIS MAP WAS PREPARED FROM
AERIAL PHOTOGRAPHS (15) AND
ALREADY EXISTING MAPS (17-19)


SEWERAGE SERVICE ARE
BOUND
BLACK DIAMOND
LAKE SAWYER
LAKE WILDERNESS
169
COVINGTON CREEK
LAKE MORTON
BN RY
196TH AVE SE
SPRING LAKE
DESIRE LAKE
CEDAR RIVER
169
SE 128TH ST
LAKE YOUNGS
LITTLE SOOS CR
164TH AVE SE
SOOS CR
JENKINS CR
SE 272ND ST
KENT BLACK DIAMOND RD
18
516
ROAD
140TH AVE SE
BIG SOOS CR
LAKE MERIDIAN
132ND AVE SE
SE 240TH ST
BIG SOOS
SE 336TH ST
18
PETROVITSKY
SE 208TH ST
515
SE 312TH ST
405
164
AUBURN
RENTON
167
167
BN RY
U P
B C M ST P & P R R
TYPE VII
167
18
900
TUKWILA
KENT
ANGLE LAKE
5
STAR
DOLLOFF LAKE
LAKE
NORTH L
18
STEEL LAKE
PACIFIC HIGHWAY S

a

FIGURE 7



ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

WETLANDS

SCALE OF MILES
1
0
1
2
LEGEND
Type I Wetlands
Type II Wetlands
Type III Wetlands
Type VII Wetlands
Type VIII Wetlands
Untyped Wetlands
SERVICE AREA BOUNDARY
BLACK DIAMOND
LAKE SAWYER
LAKE WILDERNESS
COVINGTON CREEK
LAKE MORTON
GREEN RIVER
SOOS CR
JENKINS CR
KENT BLACK DIAMOND RD
SE 272ND ST
164TH AVE SE
LITTLE SOOS CR
LAKE MERIDIAN
240TH AVE SE
BIG SOOS
SE 336TH ST
SE 312TH ST
WHITE RIVER
WOOD CHURCH RD
LAKE TAPPS
KING COUNTY
PIERCE COUNTY
AUBURN
B N RY
U P
B C M ST P B P R R
TYPE VII
ALGONA
PACIFIC CITY
LAKE GENEVA
STEEL LAKE
NORTH L
L KILLARNEY
PACIFIC HIGHWAY
169
18
16
164
167
5

1845 acres of Type I wetlands

800 acres of Type II wetlands

33 acres of Type III wetlands

20 acres of Type VII wetlands

332 acres of Type VIII wetlands

5066 acres of untyped wetlands.

Generally, the untyped wetlands (2330 acres) in the valleys are Type I and Type II. Untyped areas (2736 acres) on the surrounding plateaus are Types I, II, VII and VIII. The plants and animals found in wetlands are marked with asterisks in the species lists.

Type I Wetlands. These are seasonally wet, but are dry during most of the growing season. Much of this land is covered with grasses or is farm and pasture land. Type I wetlands serve as resting and feeding areas for large numbers of waterfowl during migratory periods and during winter. The Washington State Department of Game[2] estimates as many as 30,000 waterfowl (primarily widgeons, mallards, green-winged teals and pintails) use these temporary wetlands during migration periods and in the winter. These wetlands are of considerable importance in the Pacific Flyway.

Type II Wetlands. These are inland fresh meadows which are without standing water during most of the growing season, but are waterlogged within a few inches of the surface. Sedges (Carex spp.) are the indicator plants. The Type II wetlands are not generally utilized by waterfowl.

Type III Wetlands. These are generally wet through most of the growing season with water depths of 6 inches or more. Sedges, bullrushes and cat-tails grow here. Type III wetlands are used for feeding and nesting by resident waterfowl. The Washington State Game Department estimates that there are up to a few hundred pairs of resident waterfowl.

Type VII Wetlands. The soils of this type are waterlogged to within a few inches of the surface during the growing season. These areas are covered with a growth of trees -- red alder, willows and Western hemlock -- and can have up to a foot of standing water. They are used for nesting and feeding by waterfowl and as nesting habitat for hawks, owls and songbirds.

Type VIII Wetlands. These areas are all peat bogs. The acid conditions of these bogs provide specialized habitat for plants such as Labrador tea, swamp-laurel, sundew, and nardhack. Relatively few birds frequent the bogs.

Wetlands on the plateaus do not receive as intensive use from migratory waterfowl. Most of these wetlands are probably Types I, II, VII, and VIII. They are important and, in some cases, unique (peat bogs) habitats for resident plant and animal species. In addition, these wetlands are nursery grounds for many animals -- especially reptiles, amphibians and some small mammals -- that inhabit adjacent plant communities.

WOODED AREAS

Wooded areas of the plateaus comprise the largest natural habitat (about 39,000 acres) in the service area. Originally the characteristic vegetation was dense forests with Douglas fir, Western hemlock and Western red cedar predominating. Logging and subsequent regrowth have resulted in mixed coniferous-deciduous forests In addition to the conifers mentioned above, deciduous trees such as red alder, white alder, big-leaf maple, madrona, black and cottonwood, and various willows are common.

The most common community (about 17,800 acres) in the study area is mixed coniferous-deciduous forests growing on dry or well-drained soils. Douglas fir and red alder, in a fairly even mixture, are the dominant trees. Two other forest communities are found on moist to wet soils which generally inhibit the growth of Douglas fir. First, mixed forests, with hemlock, red cedar, and big-leaf maple as the climax species, cover approximately 11,250 acres. These communities occur in riparian settings and in areas where drainage is inhibited. Also deciduous forests of about 10,000 acres are found in the study area. The larger trees, from 50 to over 100 feet tall, include red alder, white alder, various willows, poplar, madrona, big-leaf maple, and black cottonwood. These forests are relatively uncommon in western Washington.

Considerable populations of birds and small mammals (see Appendix D) inhabit forested parts of the study area. No census information is available for non-game birds, however, the Washington State Department of Game inventories of game species have estimated the following population densities in the approximate service area:[2] black tailed deer, 690; California quail, 2420; and ring-necked pheasant, 1180.

AQUATIC AREAS

The project area includes several lakes, rivers, and streams that, together with their characteristic shoreline vegetation, provide necessary habitat for waterfowl, herons, and osprey, mammals favoring aquatic or semi-aquatic habitats (e.g. marsh shrew, Townsend's mole, beaver), amphibians and fish. Lake Youngs is a relatively unspoiled area, being part of the City of Seattle watershed and closed to the public. Development has adversely affected the habitat around Lake Tapps; however, many birds, notably osprey, use the lake. Although residential development along the shores of Lakes Meridian, Sawyer, Morton, Wilderness, Lucerne and Pipe has reduced its quality and quantity, some natural habitat still remains around these lakes.

Other lakes -- eg., Moneysmith, White, Panther, Clark, Horseshoe, Black Diamond Lakes -- have little shoreline development. The White and Green Rivers and the vegetation which borders them provide important habitat. Mill, Big Soos, Covington, and Jenkins Creeks provide valuable streamside habitats.

OTHER AREAS

Other natural habitats in the service areas include early successional forests, pastures, fields and brushlands. Early successional forests include alder thickets and mature alder-willow-poplar or alder-madrona stands that are progressing to the mixed forest types. Trees range from 20 to 50 feet in height. Coniferous seedlings -- Douglas fir, red cedar or hemlock depending upon the soils -- are scattered throughout the understory. Pastures, fields, and brushlands are natural and man-made areas of herbaceous or low, shrubby vegetation found on adequately drained soils.

RARE AND ENDANGERED SPECIES

Presently the Washington State Department of Game has no official list of rare or endangered species. The Game Department is now developing such a list using information provided by sources including the U. S. list of endangered fauna[3]; the Bureau of Sport Fisheries and Wildlife[4]; the Audubon Society Blue List[5]; the Game Department's own rare[6] and protected designations.[7] Animals which occur on all preliminary lists and range into the sewerage area[8,9,10,11] are shown in Table 11.

Suitable habitat exists in the area for all animals on the list. No systematic surveys have been made within the study area to locate rare and endangered animals and identify their habitat. In spite of this, most of the birds in Table 11 have been observed in the study area by local biologists and birdwatchers.

Two species in Table 11--the Aleutian Canada Goose and the Peregrine Falcon--are on the United States list of endangered animals. These two species are dependent on the wetlands and riparian habitat. Sixteen of the bird species (marked with asterisks) and all the mammals are on the preliminary list of rare and endangered animals in Washington State, prepared by the U.S. Bureau of Sport Fisheries and Wildlife in Olympia. One habitat of particular note is a marsh near the junction of Peasley Canyon Road and the West Valley Highway. This area is active heronry currently being used by 12 breeding pair of great blue herons. There are no known rare or endangered plant communities within the study area; however, reconnaissance data available for the study is poor.[12]

TABLE 11 . RARE, THREATENED OR ENDANGERED ANIMALS WHOSE RANGE INCLUDES THE GREEN RIVER SEWERAGE AREA.

AMPHIBIANS	
Northwest Pond Turtle	*Clemmys marmorata marmorata*
BIRDS	
Western Grebe	*Aechmophorus occidentalis*
Double-crested Cormorant	*Phalacrocorax auritus*
Great Blue Heron	*Ardea herodias*
*Green Heron	*Butorides virescens*
Whistling Swan	*Olor columbianus*
*Aleutian Canada Goose	*Branta canadensis leucopareia*
Sharp-Shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Bald Eagle	*Haliaeetus leucocephalus*
Marsh Hawk	*Circus cyaneus*
*Osprey	*Pandion haliaetus*
Gyrfalcon	*Falco rusticolus*
*Peregrine Falcon	*Falco peregrinus*
*Pigeon Hawk	*Falco columbarius*
Sparrow Hawk	*Falco sparverius*
Barn Owl	*Tyto alba*
*Spotted Owl	*Strix occidentalis*
*Black Swift	*Cypseloides niger*
*Anna's Hummingbird	*Calypte anna*

Endangered Animals List (Cont'd)

BIRDS (Cont'd)

*Bank Swallow	*Riparia riparia*
Purple Martin	*Progne subis*
*Winter Wren	*Troglodytes troglodytes*
Bewick's Wren	*Thryomanes bewickii*
*Western Bluebird	*Sialia mexicana*
*Hermit Warbler	*Dendroica occidentalis*
Western Meadowlark	*Sturnella neglecta*
*Purple Finch	*Carpodacus purpureus*
*Pine Grosbeak	*Pinicola enucleator*
*White-winged Crossbill	*Loxia leucoptera*
*Golden-crowned Sparrow	*Zonotrichia atricapilla*

MAMMALS

*Keen's Brown Bat	*Myotis keeni keeni*
*Red Bat	*Lasiurus borealis teliotis*
*Townsend's Meadow Mouse	*Microtus townsendi*
*Red Fox	*Vulpes vulpes fulva*

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*Species on preliminary list of rare and endangered animals in Washington State, prepared by the U. S. Bureau of Sport Fisheries and Wildlife (Olympia).

FISHERIES

Although the Green River Basin contains both warm and cold water fishes, data and information sufficient for critical evaluation is available only on the cold water group. Anadromous salmonids making up this group are chinook, coho, and chum salmon and steelhead, searun cutthroat, cutthroat, rainbow, and Dolly Varden trout.

The following information has been extracted from the March 1970 Puget Sound Task Force, Pacific Northwest River Basins Commission's publication, "Puget Sound and Adjacent Waters, Appendix XI, Fish and Wildlife."

Chinook spawners along with steelhead and searun cutthroat trout primarily utilize the Green River, from Tacoma City Light's diversion structure near Kanaskat, downstream to the vicinity of Kent, and Newaukum and Big Soos Creeks. Juveniles rear in the entire accessible length of the Green River, in the above tributaries, and in the estuarine waters.

Coho spawning occurs in some areas of the Green River. Tributaries maintaining coho runs include Newaukum, Crisp, Burns, and Big Soos Creeks, all upstream from Auburn; and Spring Brook and Hill Creeks near Kent. Coho juveniles also rear within most areas of the watershed throughout the year.

Chum salmon occur throughout most of the Green River drainage. In the mainstem, the adults favor the channel split and slower velocity sectors from a point near Newaukum Creek downstream to the vicinity of Kent. Chums also spawn in the same tributaries and independent drainages utilized by coho. The Green, lower Duwamish, and the marine environment of Elliott Bay are essential rearing areas.

Significant spawning reaches in some streams are delineated in Table 12.

Intragravel egg development occurs over an 11-month period because of the overlapping spawning period of various species.

"Out migration" for all species peaks during the period March-June, corresponding with high flows during spring runoff. Some migration of coho and chinook as well as trout occurs throughout the year, but this is a natural redistribution of juvenile salmonids within the stream systems. Downstream migrants spend considerable time in fresh water and the estuarine environment. The Green-Duwamish River is exceedingly important to the early fresh water rearing of chum salmon. The lower 6 to 8 miles of the Duwamish River serve as the transition zone where the fry acclimate to salt water. Extremely vital to the young are the brackish estuarine waters of the Duwamish waterway and the marine environment of Elliot Bay. The juvenile salmonids, after adjusting to the salt water environment, disperse into Puget Sound, the straits, and the ocean.

Estimated number of anadromous fish produced within the Cedar-Green River Basin waters and surviving to return as spawners are presented in Table 13.

Resident fish species are distributed and spawn throughout the Green River Basin. The upper Green River supports significant populations of rainbow trout. They also occur in many lakes and ponds and, to a lesser degree, in tributaries. Cutthroat trout are more common in lower river tributaries and ponds, but are distributed throughout most of the lakes and streams. Brook trout have been introduced into lowland and alpine lakes in addition to tributaries and connecting ponds. Dolly Varden, least common of the native species, occurs in upper sections of the Green River.

TABLE 12. SIGNIFICANT SPAWNING REACHES FOR ANADROMOUS FISH AND RESIDENT GAME FISH, CEDAR-GREEN BASINS[1]

Stream	Section	Stream Mileage	Type Of Spawning Area
Green River	Kent area to gorge	22.0 - 38.0	Numerous broad riffles, some beach and patch gravel
	Gorge to Tacoma diversion	38.0 - 52.0	Occasional riffles, mostly patch gravel sections
Newaukum Creek	Mouth to point near headwaters	0.0 - 11.0	Many short riffles, some patch gravel areas
Big Soos Creek	Mouth to point near headwaters	0.0 - 9.0	Numerous riffles, many patch gravel sections

---

[1] Additional spawning area is provided by virtually all tributaries entering within described reaches.

TABLE 13. ANADROMOUS FISH SPAWNING ESCAPEMENT, NATURAL AND (ARTIFICIAL), IN CEDAR-GREEN BASINS

Species	Range	Average (Annual)
Chinook	1,050-7,810 (16,720-22,220)	3,490 (19,370)
Coho	11,380-59,390 (30,530-78,290)	32,480 (50,890)
Chum	3,720-43,210	16,680[2]
Sockeye	45,400-190,000	90,000[3]
Summer Steelhead[4]	20-180	90[5]
Winter Steelhead[4]	28,400-52,700	39,400[5]
Searun Cutthroat[4]	32,900-60,400	45,300
Searun Dolly Varden[6]		

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[1] Periods involved in determining fish numbers are: natural (1956-1965), artificial (1961-1965), sockeye salmon (1964-1967), trout (1962-1966).

[2] Green Basin only.

[3] Cedar Basin only.

[4] Totals include natural and (artificial) escapement.

[5] Does not include those fish utilizing independent drainages.

[6] No valid totals established.

The Green River Basin is very highly developed industrially, which has damaged streams and greatly reduced natural production. Tacoma City Light's diversion structure near Kanaskat prevents anadromous fish spawning utilization of the upper Green River. Stream production is also limited by high elevation headwaters contributing cold water during much of the summer growing season.

Intense artificial propagation programs, coupled with considerable high quality natural production habitat, produce exceptional numbers of salmonids.

Fish production data are presented in Table 14.

TABLE 14. ANADROMOUS FISH NATURAL PRODUCTION (HARVEST PLUS ESCAPEMENT), CEDAR-GREEN BASINS

Species	Range	Average (Annual)
Chinook	4,200-31,240	13,960
Coho	56,900-296,900	162,400
Chum	7,440-86,410	33,360
Sockeye	48,000-190,000	90,000
Summer Steelhead	40-280	130
Winter Steelhead	42,600-79,100	59,100
Searun cutthroat	43,800-80,500	61,000
Searun Dolly Varden[2]		

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[1] Period involved in determining fish numbers is 1956-1965. Exceptions: sockeye salmon (1964-1967), searun trout (1962-1966).

[2] Production limited and therefore not determined.

The State maintains and operates the Green River Salmon Hatchery on Big Soos Creek near Auburn. Fall chinook and coho salmon and some chum are propagated at the Green River facility. The majority of fish produced here are released in the Green River.

Salmon produced in Basin waters contribute to United States and Canadian ocean commercial and sport fisheries, to commercial and sport fisheries in the Strait of Juan de Fuca and Puget Sound, and to Indian and sport fishing in fresh water areas.

Elliot Bay, which supports over 60,000 angler-days annually, is a favorite salmon sport fishing area associated with the Green River runs.

Fresh water salmon angling is also permitted in the lower Green-Duwamish Rivers. A unique night sport fishery for chinook occurs in the Duwamish. The average annual salmon catch (1964-1966) was 270, with more than 655 fish reported in 1966.

The annual utilization and harvest (1966 data) from the Green River drainage consisted of 111,450 angler-days with 22,550 steelhead taken. The 1974 Indian catch from the Duwamish-Green River totaled 13,600 salmon, mostly chinook and Coho (Washington State Department of Fisheries). Natural production contributes 35 percent of the total steelhead catch in the Green River drainage.

Fisheries information on other streams tributary to the Green or its tributaries was requested from the Washington State Department of Fisheries, and although unavailable at this time, will shortly be forthcoming.

REFERENCES

1 U. S. Department of the Interior, Wetlands of the United States, Fish and Wildlife Service, Circular 39., 1971.

2 Stendal, Art, Washington State Department of Game, Mt. Vernon, Washington.

3 U. S. Department of Interior, Fish and Wildlife Service, United States list of endangered fauna, Washington D.C., May 1974.

4 U. S. Bureau of Sport Fisheries and Wildlife (Olympia), Preliminary list of rare and endangered animals in Washington State, in use by the Washington State Department of Game.

5 Blue list, *American Birds*, December, 1974.

6 Washington State Game Department, *Rare Mammals of Washington*.

7 Game Code of the State of Washington, Sections 77.12.010 and 77.12.020.

8 Larrison, E. J. and Sonnenberg, K. G., *Washington Birds Their Location and Identification*, Seattle Audubon Society, 1968.

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10 Stebbins, R. C., *A Field Guide to Western Reptiles and Amphibians*, Houghton Mifflin, Co., Boston, 1966.

11 Wahl, T. R. and Paulson, D. R. *A Guide to Bird Finding in Washington*, Whatcom Museum Press, Bellingham, Washington, 1973.

12 Personal communication, Dr. A. Krukerberg, Department of Botany, University of Washington.

13 Wetlands Map of *The East Side Green River Watershed Projects, King County, Washington*, Soil Conservation Service, USDA, Preliminary draft EIS. (This mapping was done in cooperation with the USDI, Fish and Wildlife Service and the Washington State Department of Game).

14 Wetlands map of parts of the Green River valley, prepared for PSGC by Frank Westerlund, Remote Sensing Laboratory, Department of Urban Planning, University of Washington using U. S. Department of Interior EROS IR imagery.

15 1965 aerial photographs, PSGC.

16 1973 aerial photographs, USDA, SCS.

17 *Soil Survey of King County*, USDA, SCS in cooperation with Washington Agricultural Experiment Station, November 1973.

18 USGS, 7.5 minute series topographical map, Auburn, Black Diamond, Buckley, Cumberland, Des Moines, Maple Valley, Poverty Bay, Renton, and Sumner quadrangles.

19 Environmental Reconnaissance Inventory of the State of Washington. (provisional) U. S. Army Corps of Engineers, January 1973.

The proposed action involves the construction by Metro of an extension of its interceptor system from the City of Kent to the City of Auburn. Basis of the design for this extension, identified by Metro as the "Auburn Interceptor," is the projection of future sewer extensions and population and industry to be served by the year 2000, as developed during the RIBCO study.

The immediate purpose of the interceptor is to eliminate the discharge to the Green River of inadequately treated wastewaters from the Auburn lagoon system. For the longer term, the interceptor is a segment of a network of additional interceptors and collection systems planned to satisfy, in part, future needs for sewer service anticipated within the Green River Sewerage Area.

The extension of Metro facilities to Auburn is consistent with Metro's Comprehensive Plan, as currently revised; with that element of PSGC's IRDP dealing with sewerage facilities; and with recommendations contained in the RIBCO Water Quality Management Study. Elimination of the Auburn discharge responds to recommendations in Auburn's Comprehensive Plan, to provisions of the NPDES permit issued by DOE for its Renton treatment plant and to directives issued to Auburn by DOE. The section dealing with the relationship of the proposed action to other projects and proposals can be found in Appendix E.

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DESIGN CRITERIA AND FLOW FORECASTS

Flow forecasts for the proposed action and for the alternatives considered were developed by Stevens, Thompson and Runyan, Incorporated (STR), the consultants for RIBCO, in response to a request from Metro to determine system modifications and estimated costs for a year 2000 design.

Procedures used in determining system modifications are described by STR as follows:

"In developing the modifications to Plans A, B and C, that portion of the Auburn interceptor to be initially constructed was laid out in accordance with the design shown for Sewage Disposal Project Contract No. 74-2. The interim connection(s) and various sections of the Green River Valley Interceptor (as shown in the "Auburn Interceptor Preliminary Engineering Report") were then added to the "Auburn Interceptor", thus forming the general layout for Plans A, B and C".

"The total Auburn interceptor service area (as defined by the RIBCO regional sewerage plan) was then broken down into six drainages, each being tributary to various part(s) of the pipeline(s). These basins were then analyzed, using RIBCO's interpretation of PSGC's land use and demographic projections for the IRDP, to provide the sewage flow forecasts necessary to size the various pipes that make up Plans A, B and C".

"Each of the pipes making up the three plans were then sized, using the aforementioned year 2000 peak wet weather flows. The slopes used were obtained from the Sewage Disposal Project Contract No. 74-2. In the case of the various sections of the East Green River Valley interceptor for Plans B and C, those slopes used were from the Metropolitan Engineers' analysis conducted for the "Auburn Interceptor Preliminary Engineering Report". The RIBCO general design criteria concerning items such as Mannings "n", etc., were also used. The pipe sizes found to be necessary generally ranged in size from 36 to 72 inches".

Plans A, B and C referenced by STR are three alternative interceptor configurations originally developed by Metro for a year 2030 design. Plan A was determined by Metro to be the most cost-effective alternative and was the project for which plans and specifications were prepared. The proposed action is the single interceptor concept of Plan A, scaled to a year 2000 design flow. Plans B and C are staged construction designs and are discussed in the following chapter of this statement.

As developed by STR, drainage area 1 includes essentially all of the upland tributary area east of the Green River valley, including Black Diamond, Lake Sawyer and Lake Meridian. Drainage area 2 includes Auburn and the area south to Lake Tapps. Drainage areas 3, 4 and 5 include westerly portions of the valley and the uplands on the west side of the valley. Drainage area 6 is the lower Kent area. Although the total area is the same for all alternatives, there are slight differences in individual drainage areas used in the various plans.

The following sections, abstracted from the RIBCO report, were submitted by STR to Metro in defining the RIBCO interpretation of PSGC land use and demographic projections for the IRDP.[2]

LAND USE

For the purposes of the WQMS, all the land in the RIBCO basin is classified under three general land use categories: developed land, undeveloped available land and unavailable land. These categories represent an overall general description of the land use as opposed to a precise description of the use of each parcel of land within the area. For example, an area described as developed may actually have contained within it commercial, industrial and residential lands; developed parks and streets, as well as vacant land eligible for development. The developed area may also include small water bodies which would actually be zero population areas. Except for Lakes Young and Sawyer and the Green River, zero population areas are included as part of the land use categories.

DEVELOPED LAND

This category described land that is judged to be generally developed. The location of these developed areas was based upon preliminary work completed by PSGC for the calibration of the Activity Allocation Model. For the calibration, housing densities and developed land were determined from USGS quandrangle maps and aerial photographs. In the WQMS the developed land is subdivided into sewered and unsewered areas. For an area to be sewered or eligible for sewering, it must be identified as developed. For those areas not designated developed initially (1970), they will be so designated (and, therefore, be eligible for sewering) upon reaching a population density of three people per acre.

UNDEVELOPED UNAVAILABLE LAND

The unavailable land, as defined in the WQMS represents the area described by PSGC's Interim Regional Development Plan (IRDP) as programmed open space and land severely restricted to development due to hazardous factors. Development will not be allowed in this area and residential densities were limited to a maximum of one person per 10 acres. These areas were considered to never be sewered.

UNDEVELOPED AVAILABLE LAND

The undeveloped land is that land area remaining after the developed lands and the unavailable lands have been identified. They are considered available for development because they contain none of the restricted open space or hazardous areas. In distributing population to this land category within the AAM, if the population density reached three people per acre the undeveloped areas were reclassified as developed and were considered eligible for sewering. This system of describing land uses offers a means of handling the complexities of regional land use descriptions in sufficient detail to forecast regional wastewater flows and determine their location.

INDUSTRIAL

The industrial flows developed for the RIBCO project were based on levels of industrial employment and were provided by Puget Sound Governmental Conference (PSGC). The employee projections are based upon preliminary output of the Activity Allocation Model dated March 27, 1973. The data provided by PSGC consisted of total number of manufacturing employees, segregated by 2 digit standard industrial classifications (SIC) forecasted for employment during the years 1980, 1990 and 2000 and a similar listing for 1970 but broken down by 3 digit SIC's. Industrial flows for each sewage treatment plant service area in the RIBCO study area were then computed using these employment data and an array of multipliers called "per employee" flow factors developed for each of the 2 digit industries.

In deriving these "per employee" flow factors, data contained in the "1967 Census of Manufacturers" was used. This provided a flow factor based on national averages in terms of gallons per employee-day (gped) for each 3 digit SIC used by PSGC. Using this initial estimate and PSGC's 1970 employment data, a 1970 industrial flow was then computed for each sewage treatment plant service area.

These flows were then compared with industrial flows that were known to exist at the various sewage treatment plants in 1970. Where differences in these flows existed, the "per employee" flow factors were adjusted until the difference was eliminated. This adjustment was made by changing the initial values of the flow factors, either up or down, while still maintaining the same relative percent difference between each of them, as reported in the "1967 Census of Manufacturers", unless further investigation into particular cases indicated otherwise. The 3 digit SIC codes were then aggregated into 2 digit flow factors using a weighted average. The 1970 "per employee" flow factors thus derived are representative of the 1970 level of technology for those industries correlated in the analysis.

Since the RIBCO study involved long-range planning to the year 2000, it was necessary to compute industrial flows for the years 1980, 1990 and 2000. To accomplish this, per employee flow factors which would be representative of each of the three years in question were developed. In making such an assessment, consideration was given to such factors as technological changes or advances that are expected to take place in the manufacturing processes used by respective industries in the coming years, the type of products expected to be produced and effects of the current emphasis on reducing industrial water usage.

To determine whether the 1970 "per employee" flow factors should be increased or decreased to be representative of future years, an analysis of industrial water usage from 1953 through 1967, as published by the Department of Commerce "Census of Manufacturers", was used. This analysis consisted of driving a linear regression of "per employee" flow factors in gallons per employee per day versus time (years) for each SIC. This regression curve was then extrapolated to obtain the flow factors corresponding to the planning years 1980, 1990 and 2000.

DESCRIPTION OF PROPOSED INTERCEPTOR

The projected peak flow to the interceptor is 69.6 mgd for the year 2000. As shown in Table 15, this value for peak flow is based on serving a population of 175,858 and an area of 22,769 acres, approximately 27 percent of the tributary area. The pipe diameters shown in Figure 3 are based on the projected peak flows, on the future connection anticipated by Metro, and on the capacities provided at the slopes available for construction.

With completion of the interceptor, all wastewaters entering the system would be transported to Metro's secondary treatment plant at Renton. A NPDES permit issued by DOE provides for discharge of treated effluent to the river. Waste sludge is pumped to Metro's West Point treatment plant for digestion. Interim disposal of dewatered, stabilized sludge is by means of truck-trailer transport to a research site near Eatonville. Routing of the trucks is through Discovery Park and the Magnolia Bluff residential area. Ultimate methods of sludge handling and disposal are being studied by Metro.

Construction drawings and specifications provide for the use of reinforced concrete pipe, installed with an average of 10 to 15 feet of cover. Manhole rim elevations have been established so as to be above the backwater curve predictions for a 100-year flood.

The construction documents also include general and special provisions defining the scope, methods and quality of work to be performed. Contractor compliance with these provisions would be verified by Metro inspectors and a resident engineer. Additional limits and controls could be imposed under the terms of permits which must be obtained from the Milwaukee Railroad, Auburn, Kent, King County, and the State Department of Fisheries, Game and Highways. Plans and specifications are subject to review and approval by the DOE and the contractor is required to make application for approval of the Puget Sound Air Pollution Control Agency (PSAPCA).

TABLE 15. PROPOSED ACTION (PLAN A) - FLOW FORECAST SUMMARY

Basin	LAND USE (Acres) 1/								POPULATION						Peak Industrial Flow (mgd)			Total Peak Wet Weather Flow (mgd) 3/		
	Total	De-veloped	Unde-veloped Unavail-able	Unde-veloped Avail-able	Sewered				Total			Sewered								
					Existing 2/	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
1	56941	14474	21577	20890	1628 4/	1652	6265	11731	14585	53872	117911	10495	43294	91681	Neg.	Neg.	Neg.	4.6	13.1	25.0
2	10801	6058	3278	1465	3155	2571	2903	2903	26700	34377	35852	26340	31447	35852	7.6	9.2	12.2	23.0	25.7	29.5
3	7139	5063	1156	920	275	4788	4788	4788	24573	28066	30598	22733	26226	28758	Neg.	Neg.	Neg.	8.4	8.8	9.4
4	4064	1587	2006	471	0	1587	1587	1587	8444	12092	16872	4091	7739	12519	Neg.	Neg.	Neg.	2.1	2.5	3.1
5	1270	234	1009	27	0	234	234	234	1015	1370	1691	931	1286	1607	Neg.	Neg.	Neg.	0.3	0.3	0.4
6	2606	1526	801	279	0	1431	1431	1526	3627	4317	6275	2793	3483	5441	Neg.	Neg.	0.5	1.9	2.0	2.2
TOTAL	82821	27942	29827	24052	5058	12363	17208	22769	78944	133094	209199	67383	11475	175858	7.6	9.2	12.7	40.3	52.4	69.6

1 See Section on Design Criteria and Flow Forecasts.

2 Existing sewered area as of 1970 was selected as the point in time where allowance for peak inflow and infiltration into sewers should be reduced from 3200 gallons/acre-day to 1100 gallons/acre-day.

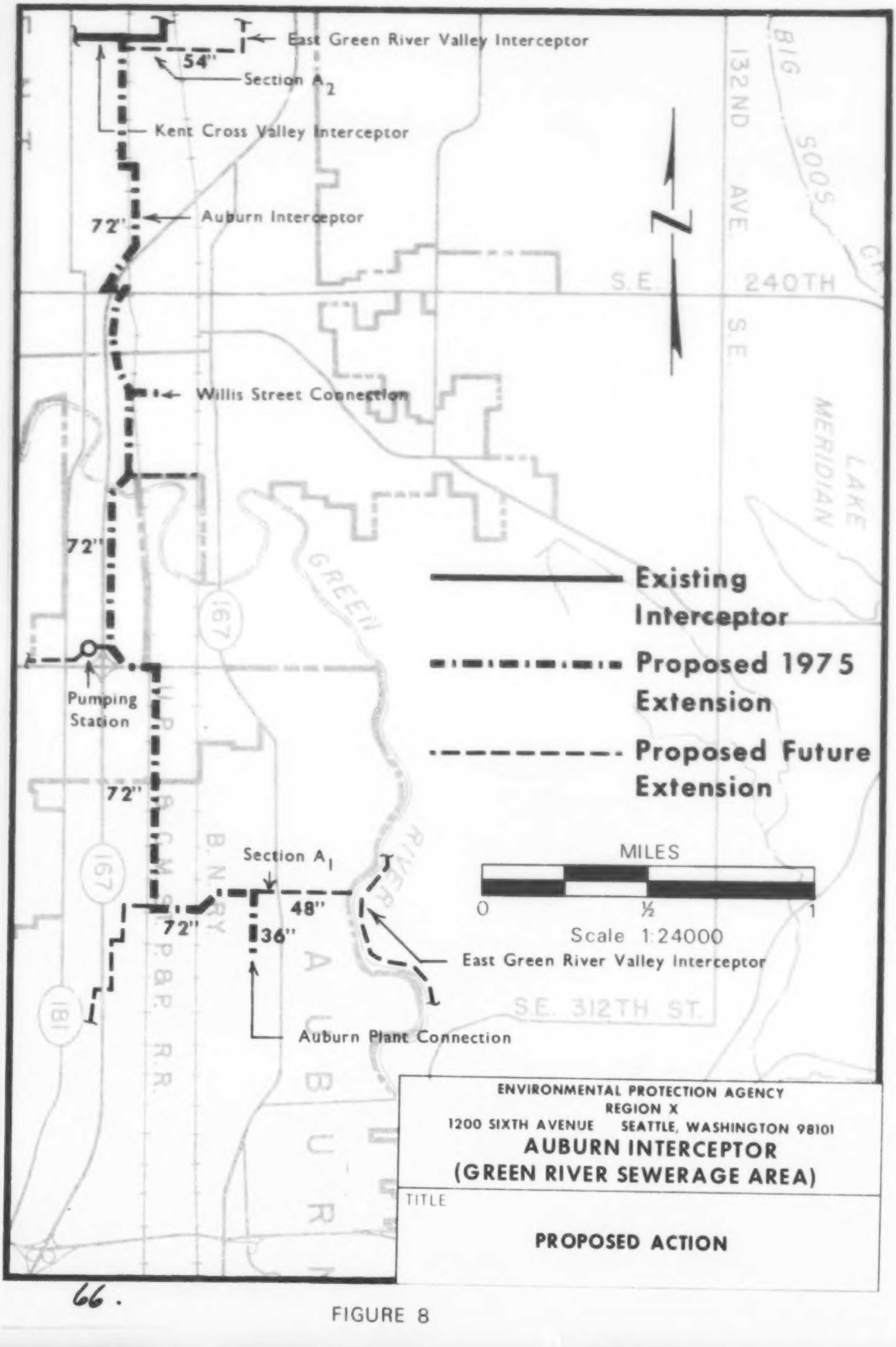
3 Total peak wet weather flow for each basin was computer as follows:

$$1980\ \text{Flow} = (\text{Existing Sewered Area})\left(\frac{3200\ \text{gallons}}{\text{Ac-day}}\right) + (1980\ \text{Sewered Area})\left(\frac{1100\ \text{gallons}}{\text{Ac-day}}\right) + (1980\ \text{Peak Industrial Flow}) + (1980\ \text{Sewered Population})\left(\frac{63\ \text{gallons}}{\text{capita-day}}\right)$$

$$1990\ \text{Flow} = (\text{Existing Sewered Area})\left(\frac{3200\ \text{gallons}}{\text{Ac-day}}\right) + (1990\ \text{Sewered Area})\left(\frac{1100\ \text{gallons}}{\text{Ac-day}}\right) + (1990\ \text{Peak Industrial Flow}) + (1190\ \text{Sewered Population})\left(\frac{67\ \text{gallons}}{\text{capita-day}}\right)$$

$$2000\ \text{Flow} = (\text{Existing Sewered Area})\left(\frac{3200\ \text{gallons}}{\text{Ac-day}}\right) + (2000\ \text{Sewered Area})\left(\frac{1100\ \text{gallons}}{\text{Ac-day}}\right) + (1990\ \text{Peak Industrial Flow}) + (2000\ \text{Sewered Population})\left(\frac{75\ \text{gallons}}{\text{capita-day}}\right)$$

4 Considered as "new" sewers because of known low inflow and infiltration rates.


East Green River Valley Interceptor
54"
Section A$_2$
Kent Cross Valley Interceptor
Auburn Interceptor
72"
Willis Street Connection
72"
Pumping Station
72"
72"
Section A$_1$
48"
36"
East Green River Valley Interceptor
Auburn Plant Connection
132ND AVE. S.E.
S.E. 240TH
BIG SOOS CR
LAKE MERIDIAN
GREEN RIVER
167
181
B.N. RY
C.M.ST.P.&P. R.R.
AUBURN
S.E. 312TH ST.
Existing Interceptor
Proposed 1975 Extension
Proposed Future Extension
MILES
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Scale 1:24000

ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

PROPOSED ACTION

66.

FIGURE 8

ALIGNMENT OF INTERCEPTOR

The proposed alignment of the interceptor is shown in Figure 8; details of alignment and construction are shown in Metro's construction drawings. Much of the route lies within or adjacent to existing rights-of-way or utility corridors. Construction in public right-of-way is subject to permit by the appropriate agency of government; construction on privately owned land is subject to granting of easment by the owner.

As noted in Metro's assessment, land uses adjacent to the proposed route range from such rural classifications as open land, pasture, and cultivated fields to such urban uses as residential, industrial plants, automobile distribution yards, and an airport. However, most of the land through which the interceptor passes in Kent and Auburn has been zoned to allow more intensive uses than now occurring. In Kent, this land has been zoned to allow industrial use, with present rural use reflecting, in part, leases to farmers until industrial development takes place. In other areas, apparent rural use represents the partial development of large industrially zoned tracts. The proposed route is near residential neighborhoods in Kent.

The only formal recreation facilities near or in contact with the construction corridor are the undeveloped Kent Park Department trail system which utilizes the Puget Power right-of-way and the Green River Levee maintenance road as trail routes. These trail locations have not been improved with the exceptiion of signs erected to mark their location. The Green River Levee is planned to eventually become a part of the Lower Green River Trail of the King County Urban Trails System. There are no other existing or planned parks or recreation areas in or near the construction corridors.

Other features of the proposed alignment include an inverted siphon crossing of the Green River and the crossing of wetlands areas just south of 216th Street and just south of South 277th Street.

COST ESTIMATE

The basis for estimating the cost of the proposed action (Table 16) andd the staged construction alternatives are described by STR as follows:

> A visual on-site inspection of all proposed routes.
>
> An analysis of the soils survey report, prepared by Metropolitan Engineers in October of 1974, to provide estimates of soil conditions for Plans B and C.

Preliminary profiles of Plans B and C, as supplied by Metropolitan Engineers, were reviewed to estimate depths of manholes and pipes.

Current unit costs were obtained from one of the contractors, which has participated in the original bidding of the Auburn Interceptor.

A cost estimate for the Auburn Interceptor (Schedules 1 and 2) was then made and compared with the previous bids. It was found the new estimate was equivalent to the median bids previously reviewed. Therefore, these unit prices were used to estimate the remaining sections and alternate plans.

TABLE 16

AUBURN INTERCEPTOR - PRELIMINARY ESTIMATE
(Based on Seattle ENR of 2198 for March 1975)

AUBURN INTERCEPTOR PLAN A

Quantity	Size	Description	Cost
31,809 L.F.	72 in.	Pipe	$ 5,598,385
36 L.F.	60 in.	Pipe	5,760
2,044 L.F.	36 in.	Pipe	204,400
501 L.F.	18 in.	Pipe	25,050
850 L.F.	-----	Jacked Pipe	333,800
200 L.F.	-----	River Crossing	175,000
1,355 L.F.	6 in.	Water Pipe	21,000
Miscellaneous Appurtenances and Structures			1,457,435
		CONSTRUCTION COST	$ 7,820,830
		Contingencies 10%	782,083
		Subtotal	$ 8,602,913
		Washington State Sales Tax (5.3%)	455,954
		Subtotal	$ 9,058,867
		Professional Services (Engineering Legal and Administration 15%)	1,358,830
		TOTAL CONSTRUCTION COSTS	$10,417,697

EAST GREEN RIVER VALLEY INTERCEPTOR - SECTION A_1

Quantity	Size	Description	Cost
4,000 L.F.	48 in.	Pipe	$ 520,000
200 L.F.	-----	River Crossing	175,000
100 L.F.	-----	Jacked Pipe	50,000
Miscellaneous Appurtenances and Structures			154,400
		CONSTRUCTION COST	$ 899,400
		Contingencies 10%	89,940
		Subtotal	$ 989,340
		Washington State Sales Tax (5.3%)	52,435
		Subtotal	$ 1,041,775
		Professional Services (Engineering Legal and Administration 15%)	156,266
		TOTAL CONSTRUCTION COSTS	$ 1,198,041

EAST GREEN RIVER VALLEY INTERCEPTOR - SECTION A_2

Quantity	Size	Description	Cost
3,850 L.F.	54 in.	Pipe	$ 577,500
200 L.F.	-----	Jacked Pipe	50,000
Miscellaneous Appurtenances and Structures			77,400
		CONSTRUCTION COST	$ 704,900
		Contingencies 10%	70,490
		Subtotal	$ 775,390
		Washington State Sales Tax (5.3%)	41,096
		Subtotal	$ 816,486
		Professional Services (Engineering Legal and Administration 15%)	122,473
		TOTAL CONSTRUCTION COSTS	$ 938,959
		GRAND TOTAL PLAN A	$12,554,700

REFERENCES

1 Letter from Stevens, Thompson and Runyan, Inc. to Metro, April 4, 1975.

2 Final Draft, Water Quality Management Study, RIBCO, (Stevens, Thompson and Runyan, Inc. - Consultants), August 1974.

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the proposed 72-inch, 25-year interceptor design include interceptor designs for the year 2030, staged interceptor construction for the year 2000, construction of a secondary treatment plant at Auburn, upgraded lagoon at Auburn and a no-action alternative. To facilitate evaluation and comparison a brief summary description of each of the year 2000 alternatives and the proposed action, together with estimates of cost and present worth are presented at the end of this chapter.

INTERCEPTOR DESIGN FOR THE YEAR 2030

The preliminary engineering, environmental assessment and construction drawings prepared by Metro were based on needs anticipated for the year 2030. These needs were developed from Metro's evaluation of future population and land use. Estimates of future population were made by extrapolating the Puget Sound Governmental Conference's projections for the year 1990.

Application of Metro's design criteria to projected population increases and industrial development resulted in planning of facilities capable of serving a population of about 255,000 and an area of some 55,000 acres within the Green River Sewerage Area.

Of the alternatives evaluated, Metro determined that a single interceptor, with a maximum diameter of 78 inches, was the most cost effective means of accommodating the projected peak flow of 114 mgd. The location selected for this facility is the same as that of the proposed action. Metro's construction cost estimate for this facility was $6,333,350, based on a local ENR Index of 1680. With adjustmnet of this estimate to the ENR of 2198 used by STR, the estimated cost of this alternative, including construction, 10 percent contingency allowance, 5.3 percent sales tax and 15 percent services allowances, becomes $10,962,300.

EPA review of Metro's planning documents resulted in a series of meetings and discussions concerning the uncertainties of projecting future sewerage needs in the Green River Sewerage Area to the year 2030. Subsequently, it was determined that funding of a 72-inch interceptor was more appropriate than the original proposal. The 72-inch line would provide the capacity to accommodate the flow projected in the RIBCO study for the year 2000.

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STAGED INTERCEPTOR CONSTRUCTION FOR THE YEAR 2000

Two alternative plans for staged interceptor construction were considered by Metro for a year 2030 design. Evaluation of staged construction for the year 2000 assumes the same configurations, with pipe diameters reduced in accordance with the lower flow projected for the year 2000. Design of staged interceptors is based on the same year 2000 peak flow projection as that for the proposed action, although the flows projected by STR from individual drainage areas differ slightly (Table 17).

Each of the staged construction alternatives would allow the Auburn lagoon system to be taken out of service with completion of the first stage of construction. Wastewater would be transported for treatment at Metro's Renton plant. Effluent would be discharged to the river at the Renton plant and excess sludge would be pumped to the West Point plant for digestion and subsequent disposal.

First stage construction of each alternative would follow the same alignment as that of the proposed action. The location of second stage construction is described in the following discussion of each of the alternatives considered.

PLAN B

The first of these alternatives, designated by Metro as "Plan B", is shown in Figure 9. First stage construction from the existing Kent Cross Valley Interceptor south to the Green River, and from 30th Street N.W. in Auburn south to the Auburn treatment plant, is identical with construction of the proposed action. The remainder of initial construction is 60-inch diameter pipe, as compared with the 72-inch diameter line proposed for the single 25-year interceptor.

Plan B anticipates 1980 construction of a 42-inch diameter interceptor to provide interim service to the east side of the Green River and 1990 construction of about 20,000 lineal feet of 42 and 48-inch diameter pipeline along the east and north side of the river. Also anticipated is 1985 construction of a relief line connecting the existing South Interceptor and the interceptor proposed to parallel it to the Renton plant. The cost estimate prepared by STR for this alternative is shown in Table 18.

TABLE 17 PLAN B & C - FLOW FORECAST SUMMARY

Basin	LAND USE (Acres) 1/								POPULATION						Peak Industrial Flow (mgd)			Total Peak Wet Weather Flow (mgd) 3/		
	Total	De-veloped	Unde-veloped Unavail-able	Unde-veloped Avail-able	Sewered				Total			Sewered								
					Existing 2/	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
1	57414	14569	21837	21008	1628 4/	1652	6265	11826	14585	53872	118574	10495	43294	92108	Neg.	Neg.	Neg.	4.6	13.1	25.2
2	10801	6058	3278	1465	3155	2571	2903	2903	26700	34377	35852	26340	31447	35852	7.6	9.2	12.2	23.0	25.7	29.5
3	7139	5063	1156	920	275	4788	4788	4788	24573	28066	30598	22733	26226	28758	Neg.	Neg.	Neg.	8.4	8.8	9.4
4	4064	1587	2006	471	0	1587	1587	1587	8444	12092	16872	4091	7739	12519	Neg.	Neg.	Neg.	2.1	2.5	3.1
5	1270	234	1009	27	0	234	234	234	1015	1370	1691	931	1286	1607	Neg.	Neg.	Neg.	0.3	0.3	0.4
6	2133	1431	541	161	0	1431	1431	1431	3627	4317	5612	2793	3483	5014	Neg.	Neg.	0.5	1.9	2.0	2.0
TOTAL	82821	27942	29827	24052	5058	12363	17208	22769	78944	133094	209199	67383	11475	175859	7.6	9.2	12.7	40.3	52.4	69.6

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1 See Section on Design Criteria and Flow Forecasts.

2 Existing sewered area as of 1970 was selected as the point in time where allowance for peak inflow and infiltration into sewers should be reduced from 3200 gallons/acre-day to 1100 gallons/acre-day.

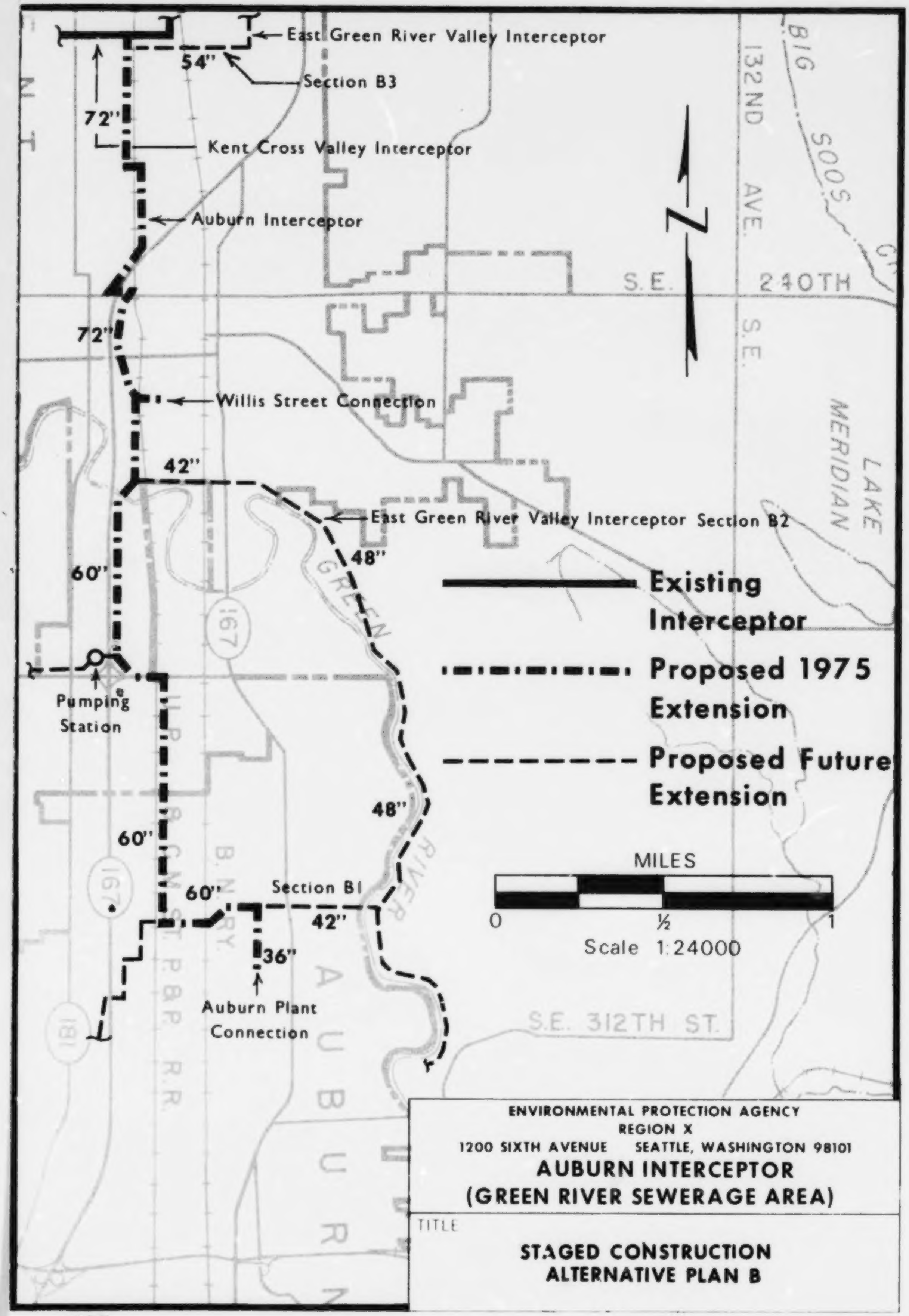
3 Total peak wet weather flow for each basin was computer as follows:

$$\text{1980 Flow} = (\text{Existing Sewered Area})\left(\frac{3200\ \text{gallons}}{\text{Ac-day}}\right) + (\text{1980 Sewered Area})\left(\frac{1100\ \text{gallons}}{\text{Ac-day}}\right) + (\text{1980 Peak Industrial Flow}) + (\text{1980 Sewered Population})\left(\frac{63\ \text{gallons}}{\text{capita-day}}\right)$$

$$\text{1990 Flow} = (\text{Existing Sewered Area})\left(\frac{3200\ \text{gallons}}{\text{Ac-day}}\right) + (\text{1990 Sewered Area})\left(\frac{1100\ \text{gallons}}{\text{Ac-day}}\right) + (\text{1990 Peak Industrial Flow}) + (\text{1190 Sewered Population})\left(\frac{67\ \text{gallons}}{\text{capita-day}}\right)$$

$$\text{2000 Flow} = (\text{Existing Sewered Area})\left(\frac{3200\ \text{gallons}}{\text{Ac-day}}\right) + (\text{2000 Sewered Area})\left(\frac{1100\ \text{gallons}}{\text{Ac-day}}\right) + (\text{1990 Peak Industrial Flow}) + (\text{2000 Sewered Population})\left(\frac{75\ \text{gallons}}{\text{capita-day}}\right)$$

4 Considered as "new" sewers because of known low inflow and infiltration rates.


East Green River Valley Interceptor
54"
Section B3
72"
Kent Cross Valley Interceptor
Auburn Interceptor
72"
Willis Street Connection
42"
East Green River Valley Interceptor Section B2
48"
60"
Pumping Station
60"
60"
Section B1
42"
48"
36"
Auburn Plant Connection
132ND AVE. S.E.
S.E. 240TH
S.E. 312TH ST.
BIG SOOS CR.
LAKE MERIDIAN
GREEN RIVER
AUBURN
B.N. RY.
C.M. ST. P.&P. R.R.
167
167
181
N
Existing Interceptor
Proposed 1975 Extension
Proposed Future Extension
MILES
0
½
1
Scale 1:24000

ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

STAGED CONSTRUCTION
ALTERNATIVE PLAN B

FIGURE 9

TABLE 18

AUBURN INTERCEPTOR PLAN B

Quantity	Size	Description	Cost
14,373 L.F.	72 in.	Pipe	$ 2,529,648
17,436 L.F.	60 in.	Pipe	2,789,760
2,044 L.F.	36 in.	Pipe	204,400
501 L.F.	18 in.	Pipe	25,050
850 L.F.	-----	Jacked Pipe	333,800
200 L.F.	-----	River Crossing	175,000
1,355 L.F.	6 in.	Water Pipe	21,000
Miscellaneous Appurtenances and Structures			1,380,035
		CONSTRUCTION COST	$ 7,458,693
		Contingencies 10%	745,869
		Subtotal	$ 8,204,562
		Washington State Sales Tax (5.3%)	434,842
		Subtotal	$ 8,639,404
		Professional Services (Engineering Legal and Administration 15%)	1,295,911
		TOTAL CONSTRUCTION COSTS	$ 9,935,315

EAST GREEN RIVER VALLEY INTERIM CONNECTION - SECTION B_1

4,000 L.F.	42 in.	Pipe	$ 460,000
200 L.F.	-----	River Crossing	175,000
100 L.F.	-----	Jacked Pipe	50,000
Miscellaneous Appurtenances and Structures			154,400
		CONSTRUCTION COST	$ 839,400
		Contingencies 10%	83,940
		Subtotal	$ 923,340
		Washington State Sales Tax (5.3%)	48,937
		Subtotal	$ 972,277
		Professional Services (Engineering Legal and Administration 15%)	145,842
		TOTAL CONSTRUCTION COSTS	$ 1,118,119

EAST GREEN RIVER VALLEY INTERCEPTOR - SECTION B_2

15,500 L.F.	48 in.	Pipe	$ 2,015,000
4,000 L.F.	42 in.	Pipe	460,000
367 L.F.	-----	Jacked Pipe	133,500
Miscellaneous Appurtenances and Structures			619,125
		CONSTRUCTION COST	$ 3,227,625
		Contingencies 10%	322,763
		Subtotal	$ 3,550,388
		Washington State Sales Tax (5.3%)	188,171
		Subtotal	$ 3,738,559
		Professional Services (Engineering Legal and Administration 15%)	560,784
		TOTAL CONSTRUCTION COSTS	$ 4,299,343

TABLE 18 Continued

EAST GREEN RIVER VALLEY INTERCEPTOR - SECTION B_3

3,850 L.F.	54 in.	Pipe	$	577,500
200 L.F.	-----	Jacked Pipe		50,000
Miscellaneous Appurtenances and Structures				77,400
		CONSTRUCTION COST	$	704,900
		Contingencies 10%		70,490
		Subtotal	$	775,390
		Washington State Sales Tax (5.3%)		41,096
		Subtotal	$	816,486
		Professional Services (Engineering Legal and Administration 15%)		122,473
		TOTAL CONSTRUCTION COSTS	$	938,959
		GRAND TOTAL PLAN B	$16,291,800	

PLAN C

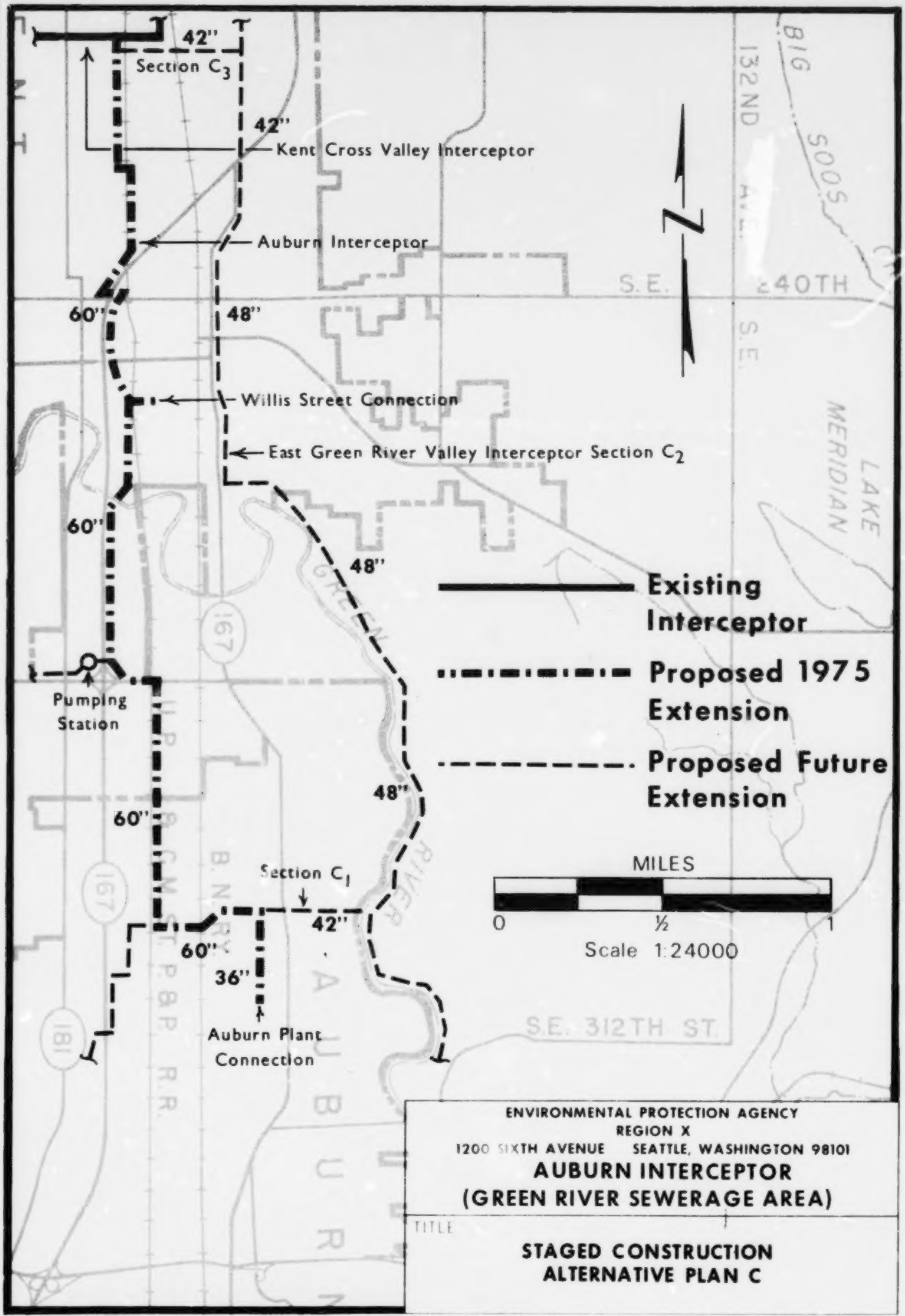
Metro's revised "Plan C" is shown in Figure 10. As indicated previously, first stage construction follows the alignment of the proposed action. However, maximum pipe diameter is reduced to 60 inches. Future stages include 1980 construction of an interceptor to provide interim service to the east side of the Green River, as in Plan B, and 1985 construction of the 42 and 48 inch diameter, East Green River Valley Interceptor, beginning at N.E. 30th Street in Auburn and extending northerly and westerly along the east side of the river to Kent, at which point the proposed alignment is northerly through highly developed commercial area in Kent. As in the proposed action and in Plan B, this alternative also anticipates 1985 construction of a relief line connecting the two interceptor stages north of Kent.

The complete separation of facilities in Plan C does permit greater flexibility in adjusting the timing and capacity of second stage facilities to more closely correspond to future needs. However routing through the commercial area of Kent would be more costly and disruptive than the single line skirting Kent in the proposed action and Plan B. The cost estimate made by STR for this alternative is shown in Table 19.

REGIONAL TREATMENT PLANT AT AUBURN

As an option to interception to Metro's Renton plant, this alternative provides for a regional treatment facility at Auburn, with continuation of effluent disposal to the Green River at Auburn. This alternative assumes the dismantlement of the existing lagoon system and construction of a conventional secondary sewage treatment plant. Although not in conformance with Metro's Comprehensive Plan, nor responsive to DOE's order, a properly operated facility of this type is capable of producing an effluent which would meet the NPDES requirements.

The alternative of providing regional waste treatment at Auburn was evaluated during the RIBCO study and was included in two of the four final configurations developed for the Metro service area. In conjunction with treatment at Auburn, these configurations also provide for a 5-1/2 mile interceptor extension to serve the lower Kent area. The four final configurations resulted from a screening process applied to a large number of alternative systems combining various configurations of existing and proposed facilities.


42"
Section C_3
42"
Kent Cross Valley Interceptor
Auburn Interceptor
60"
48"
Willis Street Connection
East Green River Valley Interceptor Section C_2
60"
48"
Pumping Station
60"
48"
Section C_1
42"
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Auburn Plant Connection
Existing Interceptor
Proposed 1975 Extension
Proposed Future Extension
MILES
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132ND AVE. S.E.
BIG SOOS CR.
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AUBURN
B.N. R.R.
C.M. ST. P.&P. R.R.
167
181

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REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

STAGED CONSTRUCTION
ALTERNATIVE PLAN C

FIGURE 10

TABLE 19

AUBURN INTERCEPTOR PLAN C

Quantity	Size	Description	Cost
31,809 L.F.	60 in.	Pipe	$ 5,089,440
2,044 L.F.	36 in.	Pipe	204,400
501 L.F.	18 in.	Pipe	25,050
850 L.F.	----		333,800
200 L.F.	----		175,000
1,355 L.F.	6 in.	Water Pipe	21,000
Miscellaneous Appurtenances and Structures			1,457,435
		CONSTRUCTION COST	$ 7,306,125
		Contingencies 10%	730,613
		Subtotal	$ 8,036,738
		Washington State Sales Tax (5.3%)	425,947
		Subtotal	$ 8,462,685
		Professional Services (Engineering Legal and Administration 15%)	1,269,403
		TOTAL CONSTRUCTION COSTS	$ 9,732,088

EAST GREEN RIVER VALLEY INTERIM CONNECTION - SECTION C_1

4,000 L.F.	42 in.	Pipe	$ 460,000
200 L.F.	-----	River Crossing	175,000
100 L.F.	-----	Jacked Pipe	50,000
Miscellaneous Appurtenances and Structures			154,400
		CONSTRUCTION COST	$ 839,400
		Contingencies 10%	83,940
		Subtotal	$ 923,340
		Washington State Sales Tax (5.3%)	48,937
		Subtotal	$ 972,277
		Professional Services (Engineering Legal and Administration 15%)	145,842
		TOTAL CONSTRUCTION COST	$ 1,118,119

EAST GREEN RIVER VALLEY INTERCEPTOR - SECTION C_2

9,000 L.F.	42 in.	Pipe (High Cost)	$ 1,440,000
17,700 L.F.	48 in.	Pipe	2,301,000
4,300 L.F.	48 in.	Pipe (High Cost)	752,500
Miscellaneous Appurtenances and Structures			814,327
		CONSTRUCTION COST	$ 5,307,827
		Contingencies 10%	530,783
		Subtotal	$ 5,838,610
		Washington State Sales Tax (5.3%)	309,446
		Subtotal	$ 6,148,056
		Professional Services (Engineering Legal and Administration 15%)	922,208
		TOTAL CONSTRUCTION COSTS	$ 7,070,264

TABLE 19 Continued

EAST GREEN RIVER VALLEY INTERCEPTOR - SECTION C_3

3,850 L.F.	42 in.	Pipe	$	442,750
200 L.F.	-----	Jacked Pipe		50,000
Miscellaneous Appurtenances and Structures				77,400
		CONSTRUCTION COST	$	570,150
		Contingencies 10%		57,015
		Subtotal	$	627,165
		Washington State Sales Tax (5.3%)		33,240
		Subtotal	$	660,405
		Professional Services (Engineering Legal and Administration 15%)		99,061
		TOTAL CONSTRUCTION COSTS	$	759,466
		GRAND TOTAL PLAN C		$18,679,900

In rural King County, the study resulted in three final configurations to serve the Lake Sawyer - Black Diamond area. One alternative provided for a secondary treatment plant at Black Diamond, with effluent disposal to the Green River; the other alternatives provided for the construction of interceptors to Auburn. The recommended configuration proposed that service initially be provided by constructing a gravity sewer line to the existing Timberlane pump station on Jenkins Creek and, about 1988-1990, constructing interceptors along Covington and Big Soos Creeks to Auburn.

Construction of these interceptors would eliminate the need for pumping Lake Sawyer - Black Diamond wastes through teh Cascade Sewer District system and pumping again through the City of Kent system.

For the year 2000, design flows from the Lake Sawyer - Black Diamond area are 1.4 mgd annual average and 3.0 mgd peak winter flow. Year 2000 design flows for Auburn are 36 mgd annual average and 55 mgd peak, including the contribution from Lake Sawyer - Black Diamond.

As planned, construction of a regional treatment facility at Auburn, together with construction of an interceptor extension to lower Kent, would provide capacity equivalent to that provided by the proposed action and would permit essentially the same extension of sewer service as permitted by the proposed action. The construction of the treatment plant at Auburn would result in the discharge of 35 mgd of effluent meeting the limits defined for secondary treatment. The possible effects this discharge might have on water quality in the Green River are discussed in the Water Quality Impact section.

With over three-fourths of the year 2000 wastes diverted to a plant at Auburn, there would be correspondingly less wastewater transmitted to Renton and less sludge pumped to West Point for digestion than would occur with the proposed action. Fewer additional truck trips would be required to dispose of this material.

No application for funding this alternative has been made by the City of Auburn or Metro; nor has it been placed on DOE's priority list. At such time as these events occur, EPA grant regulations require that a facilities plan and construciton drawings be prepared, reviewed, and approved before a grant for construction can be made. The facilities plan includes preparation of an environmental assessment and the potential that an environmental impact statement would have to be prepared by EPA. A delay of several years should be anticipated before this alternative could be fully implemented.

UPGRADING OF LAGOON SYSTEM AT AUBURN

In its present configuration, the Auburn lagoon system consists of pretreatment units, two mechanically aerated cells, and three convential aerobic cells. Total area of the aerated cells is six acres; combined area of the aerobic cells is 32 acres. Each of the aerated cells has three mechanical aerators. The engineering consultant for Auburn, URS-Hill, Ingman, Chase, reports that the annual average design flow of the lagoon system is 3.2 mgd, although it is possible to pump over 10 mgd through the plant.

At the present time, the actual annual average flow is about 1.9 mgd. If it is assumed that the increase in flow to the 35 mgd projected for the year 2000 occurs at a uniform rate, the capacity of the lagoon system would be reached in approximately a year.

As noted previously, the Auburn treatment facility is typical of other lagoon systems in its inability to meet suspended solids limits for secondary treatment. A number of methods of reducing suspended solids concentrations to acceptable levels have been investigated, including the use of physical-chemical treatment, rock or sand filters, and screening. At the present time, however, an EPA grant for any of these techniques except physical-chemical treatment would have to be conditioned to require the grantee to assure the taking of corrective measures if the selected technique failed to produce the desired results.

Suspended solids concentrations in lagoon effluent can be reduced by either sedimentation or flotation of the algae, preceded by chemical coagulation. In response to a request from EPA, Metro reinvestigated the upgrading of the Auburn lagoon system. The air flotation technique was selected by Metro for further evaluation. For purposes of evaluation, Metro assumed an average flow of 2 mgd, the use of alum as a coagulant, the use of sulfuric acid to reduce alum requirements, and an alkaline neutralization step prior to discharge of the effluent.

Utilization of the air flotation process would result in the removal of an estimated 7 million gallons per year of 3% sludge at 2 mgd average flow. An in depth study of methods of disposal of the sludge was not made. In addition to treatment units necessary for air flotation and removal of suspended solids, adequate chlorine contact capacity also would have to be provided. Metro's preliminary evaluation also indicated the probable need for effluent pumping with dissolved air flotation and the possible need for effluent dechlorination prior to discharge.

Upgrading the Auburn lagoon system would not conform to Metro's Comprehensive Plan or the RIBCO recommendations, nor would it be responsive to the DOE order to eliminate the discharge of effluent to the Green River at Auburn. However, the addition of an algae removal process would result in an effluent meeting with the NPDES limits as defined for secondary treatment. With no wastes transported to the Renton plant, there would be no increase, attributable to the Green River Sewerage Area, in sludge digestion and disposal at the West Point plant.

Although there appears to be reserve capacity of approximately 1 mgd with an upgraded lagoon, this alternative must be considered only a temporary solution to an identified water quality problem At such time as its capacity is reached, it is probable that DOE will reimpose its restrictions. It should be noted that these prior restrictions are only limited to the provision of sewer service. Unless specific limits are implemented by all of the concerned municipalities, there is no assurance that growth and development will not continue, utilizing other municipal systems or privately constructed facilities for treatment and disposal of wastewaters. Since one such method is the use of septic tanks and drainfields, it can be anticipated that surface and groundwater problems related to this type of facility can be anticipated to increase.

Metro has made a preliminary cost estimate for upgrading the lagoon system, with no allowance for expansion of capacity. This estimate was $750,000 including allowances of $250,000 each for an air flotation process, chlorine contact and neutralization and effluent or interstage pumping. Total annual operating and maintenance costs for these additions was estimated to be $79,000.

This alternative does involve the least initial cost; however, it does not represent a facility which allows for the provision of service comparable to that of the proposed action or the other alternatives, nor does it consider the cost of providing treatment and disposal of wastewaters at locations other than Auburn.

NO ACTION ALTERNATIVE

Absolutely no action represents a decision not to fund any project at all. Exercise of this option would result in the continued operation of the Auburn lagoon system and the discharge to the Green River of inadequately treated wastewater. A decision to allow this discharge to continue is contrary to the goals and provisions of Public Law 92-500, "Federal Water Pollution Control Act Amendments of 1972".

COMPARISON OF PROPOSED ACTION AND ALTERNATIVES

For comparison purposes, STR assumed the Auburn Interceptor to be in service by 1975. Sections A_1, B_1 and C_1 of the East Green River Valley interceptor, regardless of their status as interim or permanent connections were staged to be in-service by 1980 because of the existing need for interceptor sewer service on Auburn's east hill. Sections A_2, B_3 and C_3 of the East Green River Valley interceptor were staged to be in-service by 1985, based on assumed flows in Metro's GR41A interceptor and the known capacity of the GR41B interceptor. Sections B_2 and C_2 of the East Green River Valley interceptor were scheduled to be in-service at such time that the Auburn Interceptor "bottle necks" in that pipe lying immediately north of the Auburn lagoon. The interim connections B_1 and C_1 were then sized accordingly.[1]

Table 20 shows the total project costs for each plan and the corresponding years that funds have been proposed for expenditure. In addition, the table shows the 1975 present worth of the total (comparative) project costs, at an interest rate of 5-5/8% for Plans A, B and C.

Metro made a comparison of costs between the Plan A interceptor initially proposed and a 35 mgd treatment plant at Auburn. These costs have been revised by STR to reflect current cost indices and are shown in Table 21.

TABLE 20. COMPARISON OF YEAR 2,000 INTERCEPTOR ALTERNATIVES

Plan	Description	Limiting Capacity (mgd)	Initial Cost ($x1,000) 1975 Base - ENR Index - 2,198				Present Worth
			1975	1980	1985	1990	
A	Auburn Interceptor	74	10,417.7			----	10,417.7
	Sec. A_1 (Interim)	32		1,198.0			884.8
	Sec. A_2 (East Green)	38			939.0		512.1
TOTAL							11,814.6
B	Auburn Interceptor	54	9,935.3				9,935.3
	Sec. B_1 (Interim)	24		1,118.1			825.7
	Sec. B_2 (East Green)	27				4,299.3	1,731.7
	Sec. B_3 (East Green)	38			939.0		512.1
TOTAL							13,004.8
C	Auburn Interceptor	54	9,732.1				9,732.1
	Sec. C_1 (Interim)	24		1,118.1			825.7
	Sec. C_2 (East Green)	26				7,070.3	2,847.8
	Sec. C_3 (East Green)	20			759.5		414.2
TOTAL							13,821.6

TABLE 21

COST COMPARISON OF PROPOSED ACTION AND AUBURN STP

	SECONDARY TREATMENT PLANT	INTERCEPTOR AS PROPOSED
Auburn Interceptor		$11,814,600
Expansion of Renton Treatment Plant to treat the additional volume generated in the sewerage area		9,297,600
Auburn Secondary Treatment Plant	$20,925,100	
An Interceptor to collect sewage between Auburn and Kent (to make up for the loss of joint use of the larger interceptor)	3,945,600	
TOTAL	$24,870,700	$21,112,200
OPERATING AND MAINTENANCE COSTS (20 years)		
Renton Treatment Plant		$ 374,000 or present worth of 4,423,400
Auburn Treatment	$ 935,000 per yr. or present worth of 11,058,600	
TOTAL PRESENT WORTH		
Capital, Operating and Maintenance Costs	35,929,300	25,535,900

REFERENCES

1 Letter from Stevens, Thompson and Runyan, Inc. to Metro, April 4, 1975.

LAND USE IMPACTS

The relationships between wastewater management systems and land use patterns are largeely unknown. Numerous studies nationwide have demonstrated that changes in land uses do occur as extensive and advanced sewerage systems replace septic tanks or inadequate existing systems. Without adequate control, these changes in land use can bring about significant deterioration of environmental quality.

Service and utility systems, such as wastewater management, transportation, water supply, and energy systems, establish the structure and boundaries for the land development process. The relationship between these systems and development can be direct and immediate (e.g., no construction without roads to transport building materials; no occupancy permits are issued without water, sewer, and power hookups), or it can be indirect, over the long term. The indirect influences of such systems on development are poorly understood and more difficult to determine and assess. It is clear, however, that the process of planning and regulating land use is a direct function of the development of service and utility systems.

The Environmental Protection Agency recognizes that while wastewater programs may lead to expeditious resolution of water quality problems, the provision of sewerage systems also may remove land development constraints. In this respect, EPA's decision to fund the proposed project may be deemed a significant "land use" decision. The provision of sewers, coupled with the inadequate exercise of land use controls, can spawn land development patterns which may, in the long term, be detrimental to environmental quality.

In view of these case histories and in recognition of the fact that the planning and development of the various systems in the Green River valley appear to have been influenced by development-oriented land use plans and policies of local government, EPA (1) encourages decision-makers to provide the opportunity for widespread citizen participation in planning for the future; (2) recognizes that the proposed action can provide the foundation for comprehensive solutions to social, economic and physical environmental problems by proper planning, and (3) also recognizes that the proposed action will provide opportunities for the cities of Auburn, Algona, Pacific, Kent, and Black Diamond, and King and Pierce Counties, to redefine their land use goals and control their own patterns and rates of growth.

Historically, growth in the Green River Valley Sewerage Area has taken place regardless of the presence or absence of sewerage utilities. A report of the Task Force for Citizen Participation in the

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RIBCO planning program (The Growth Issue in the Green/Cedar River Basins of King County, November 1974) substantiates this by concluding, "Metro's development and extension of sewage interceptors (dependent on the existence of sufficient customers to finance the revenue bonding for these facilities) follows, rather than precedes development."

Wastewater disposal systems in the Seattle metropolitan area have not been a primary development-inducing factor. Other development-generating conditions have predominated in King County. Sanitary sewer service has typically responded to, rather than preceded, the "leapfrog" development experienced by much of the County. The most important factors influencing the Seattle area's present land use pattern have been speculative and political actions by private industries, improved transportation facilities, and the provision of water supply systems.

The proposed interceptor will not have significant primary effects upon land use. Since construction will take place within the right-of-way corridor, the direct impacts on existing land uses will be minimal. One residence has been removed and the resident assisted in re-establishing elsewhere under Metro's relocation plan.

The most significant indication of the proposed project will be the secondary impacts of the increased capacity for development allowed by the expanded sewerage service. The issue raises such questions as, how much growth will the interceptor allow; what effects will the interceptor have on the semi-rural character of the sewerage area; and is growth in the Green River valley area inevitable?

Expansion of sewering is one of the pre-conditions for continued development of the Green River valley. The proposed action, if implemented, will lift the present Department of Ecology ban on extensions of the City of Auburn's sewer system and could increase development pressures on available open land or on land currently developed at low densities. The physical existence of the Auburn Interceptor, in itself, will not create urban development, as growth and development are the result of a broad set of interrelated phenomena such as birthrates, economic conditions, and migration. The project will, however, allow urban development dependent upon public sewerage facilities to occur, if the local governmental bodies with existing land use planning powers determine that such development is appropriate.

The proposed interceptor is consistent with Federal, State, regional, and local utility planning policy and will allow the valley cities to implement their local comprehensive plans. Only the local governments retain the legal authority to control and direct the use of the land within their jurisdictions by such measures as zoning actions. Because local comprehensive plans are adopted and approved by elected representatives, the land uses proposed by the Green River Sewerage Area local comprehensive plans represent the desires of the study area residents. The comprehensive land use plans are the only existing identifiable growth and development policy statements regarding land use within the sewerage area which are implementable at this time.

Projections indicate that growth will most likely continue in the Green River valley. Any alternative solution which provides Auburn with adequate waste treatment facilities will lift the Department of Ecology's restrictions on trunk, lateral and collector sewers. The availability of such facilities will allow growth in undeveloped areas and the resultant impacts overall would be no different than that provided by the proposed action. Because additional sewer services must be made available to sustain the conditions for local population and industrial growth, it would be unreasonable to assign the proposed project any significant growth-constraining or growth-forcing utility. A number of alternative engineering configurations could supply the same services and provide the same capacity for expansion. It is expected that staged interception or resort to local municipal and industrial sewerage systems (beginning with upgrading of the Auburn lagoon system) will have precisely the same impact on local development as the proposed project. Funds for alternative projects probably would continue to be available out of state and Federal subsidies and, in all probability, the 10% local share of financial requirements would not be withheld by communities that have proved to be in active competition for development.

Given the opportunities for other solutions to drainage and sewage disposal constraints, then, the growth-stimulating role of the proposed interceptor must be dismissed as a critical issue. More importantly, attention should be directed to the issue of growth-rate and the saturation development called for by local land use plans. If employment and populations trends, which characterized the period 1961-1970 in the Green River valley, are allowed to continue without policy constraints how much land can be expected to be consumed by 1990?

Table 22 describes the amount of land that may be consumed if a continuation of trends exists in the Green River valley through 1990. The allocation of population and employment is based upon a continuation of trends, however, the densities or amount of land consumed per employee or persons was based on the 1970 densities and does not reflect a trend towards increased utilization of land by developers. It does show that if development were to occur at 1970 densities how much land by 1990 would be developed and for what type.

TABLE 22 . GREEN RIVER VALLEY LAND USE TRENDS IN ACRES[2]

LAND USE CATEGORY	1961	% of Total Area	1970	% of Total Area	% Change '61-'70	1980	% of Total Area	%Change '70-'80	1990	% of Total Area	% Change '80-'90
Single Family	2218	6.6%	2752	8.2%	24.1%	3024	9.1%	9.9%	3441	10.3%	13.8%
Multi-family	90	.3%	329	1.0%	265.6%	414	1.2%	25.8%	650	2.0%	57.0%
Total Residential	2308	6.9%	3081	9.2%	33.5%	3438	10.3%	11.6%	4091	12.3%	19.0%
Retail/FIRES*	124	.4%	549	1.7%	342.7%	770	2.3%	40.3%	1912	5.7%	148.3%
Manu./WTCU**	766	2.3%	1892	5.7%	147.0%	2438	7.3%	28.9%	3457	10.4%	41.8%
Gov't/Education	676	2.0%	581	1.7%	-14.1%	772	2.3%	32.9%	883	2.6%	14.4%
Total Employment	1566	4.7%	3022	9.1%	93.0%	3980	11.9%	31.7%	6252	18.7%	57.1%
Total Employment	3874	11.6%	6103	18.3%	57.5%	7418	22.2%	21.5%	10343	31.0%	39.4%
Public	341	1.0%	401	1.2%	17.6%	572	1.7%	42.6%	952	2.9%	66.4%
Streets	2261	6.8%	4129	12.4%	82.6%	4458	13.4%	8.0%	5189	15.5%	16.4%
Special	142	.4%	456	1.4%	221.1%	456	1.4%	0.0%	456	1.4%	0.0%
Total Development	6618	19.9%	11089	33.3%	67.6%	12904	38.7%	16.4%	16940	50.8%	33.8%
Vacant	26375	79.2%	21906	65.7%	-16.9%	20091	60.3%	-8.3%	16055	-18.3%	-21.7%
Water	323	1.0%	323	1.0%	0.0%	323	1.0%	0.0%	323	1.0%	0.0%
TOTAL AREA	33318	100.0%	33318	100.0%	0.0%	33318	100.0%	0.0%	33318	100.0%	0.0%

---

* Finance, Insurance, Real Estate and Services

** Wholesale, Transportation, Communications and Utilities

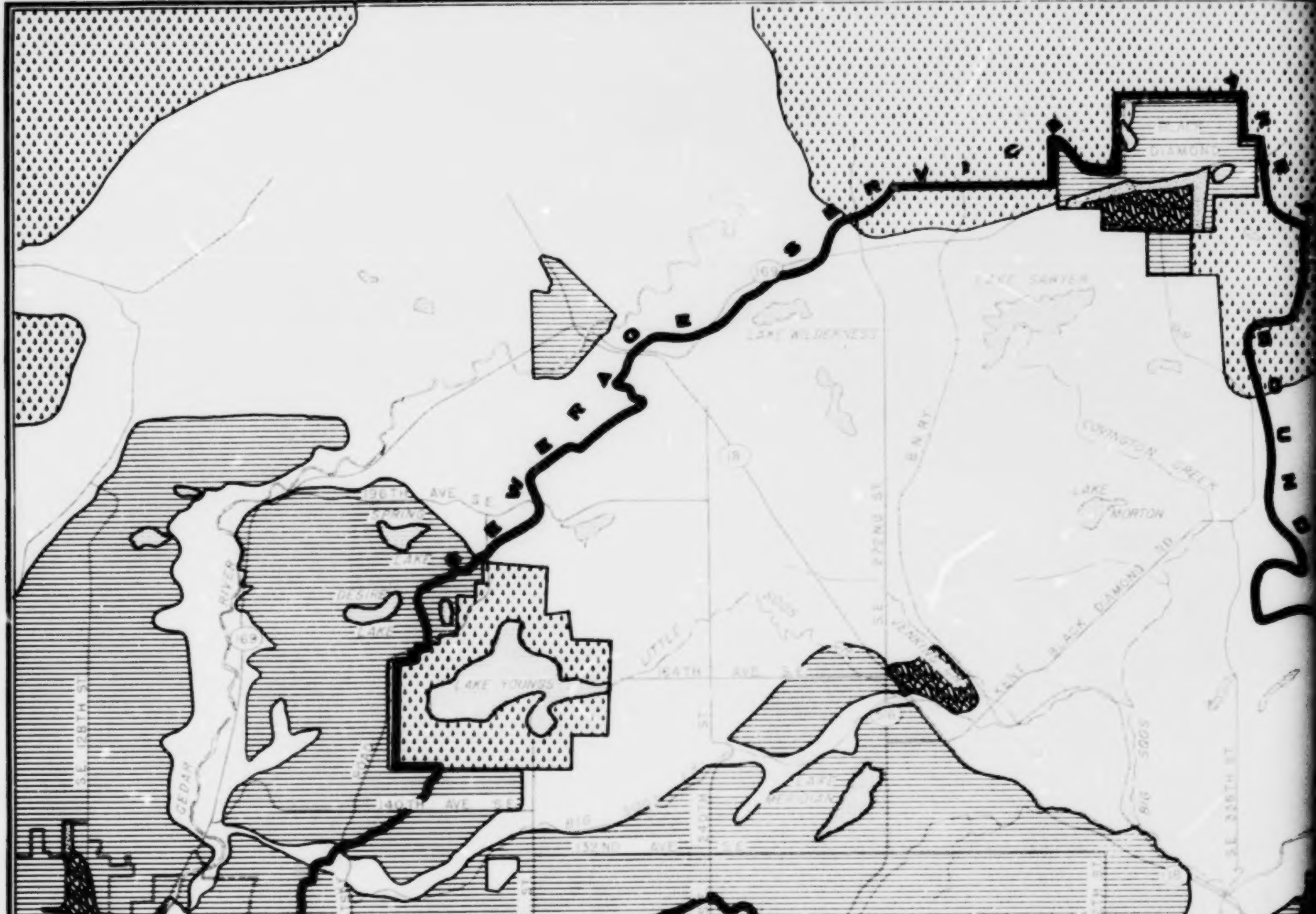
The figures in Table 22 indicate that if the 1990 estimates of land use in the Green River valley are at all realistic, then the jurisdictions of the valley face two basic problems: overplanning for residential and industrial land use and underplanning for commercial, public and institutional and parks and open space. This dilemma is not unique to the Green River valley. It is common to every jurisdiction that prepares a comprehensive land use plan attempting to achieve its objectives without considering how development is staged over time.

Table 22 indicates that if no regionally imposed policy constraints are used in distributing expected growth throughout the region and if growth continues as it has in the past, the Green River valley will undergo relatively rapid urbanization. In 1961, approximately 80% of the valley lands were vacant. By 1990, open-space or vacant lands will be reduced to under 50%. Urban business activities will occupy a significant portion of the newly urbanized areas. In 1961, employment acreage accounted for 4.7% of the total valley area. In 1990, this category is projected to consume 18.7% of the available land. Manufacturing/WTCU (Wholesaling, transportation, communications and utilities) land uses are expected to consume 10.4% of the valley lands by 1990. Major increases are also expected to occur in retail/service acreage and in the amount of streets necessary to service the projected level of activity.[2] See Figures 11 and 12 for 1990 land use projections.

Although the level of activity projected for the valley in 1990 does amount to a substantial increase in growth, it represents only a small portion of the optimistic land use forecasts which comprise the valley comprehensive plans. Studies by Corff and Shapiro, Inc.[1] and B. Beam[2] of the PSGC show that the valley jurisdictions are overplanning, and perhaps overzoning, for industry. See Table 23 and Table 4.

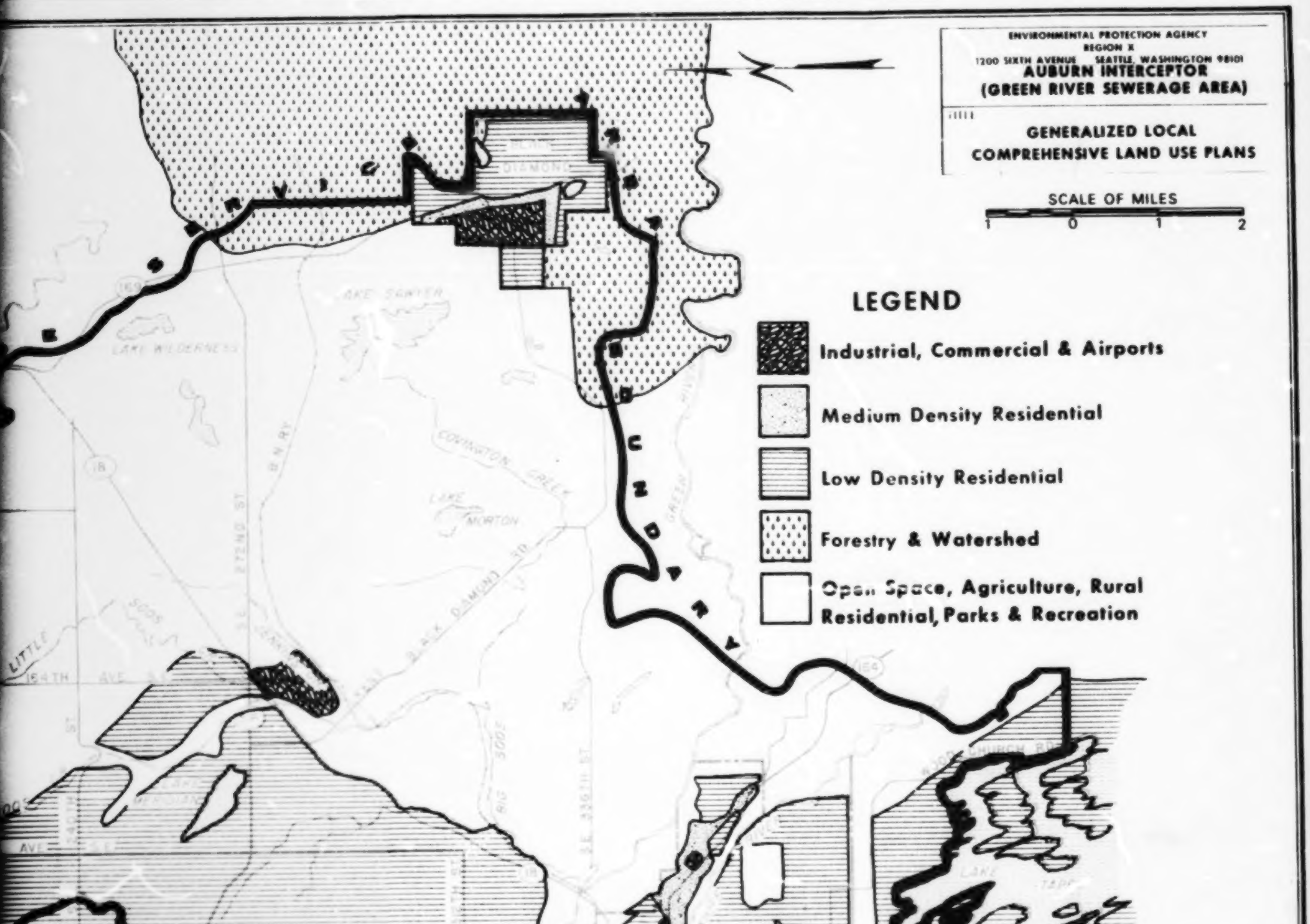
In the 32,320 acre study area, it was found the number of acres (11,610) planned for industry in the comprehensive plans reflects a 500% increase over the valley industrial land used in 1970. This figure is also in excess of number of the industrial acres (3,457) that the valley can reasonably expect to receive by 1990. "This vast amount of planned industrial land (seems) to be out of balance with the amount of land planned for commercial utilization. By 1990, the valley can reasonably expect to receive 1,912 acres of commercial development but only 1,230 acres have been reserved for that purpose"[2] (and only 1,750 acres are zoned for that use).

The magnitude of overplanning for industrial land becomes more apparent when viewed in a regional context. By 1990, the entire Central Puget Sound Region will have a projected demand for 7,006 acres of manufacturing land. Valley jurisdictions are planning for over 1½ times that much manufacturing land to be located just in the Green River valley.[2]


S E W E R A G E S E R V I C E
BLACK DIAMOND
LAKE SAWYER
LAKE WILDERNESS
COVINGTON CREEK
LAKE MORTON
BLACK DIAMOND RD
B.N.R.Y.
196TH AVE S.E.
SPRING LAKE
LAKE DESIRE
LAKE YOUNGS
LITTLE SOOS
164TH AVE S.E.
140TH AVE S.E.
132ND AVE S.E.
SE 128TH ST
CEDAR RIVER
BIG SOOS
LAKE MERIDIAN
SE 240TH ST
SE 335TH ST
GREEN RIVER
R E N T O N
K E N T
A U B U R N
DOLLOFF

a

FIGURE 11


SCALE OF MILES
1
0
1
2
LEGEND
▨ Industrial, Commercial & Airports
▨ Medium Density Residential
▤ Low Density Residential
▨ Forestry & Watershed
☐ Open Space, Agriculture, Rural Residential, Parks & Recreation
SERVICE AREA BOUNDARY
BLACK DIAMOND
LAKE SAWYER
LAKE WILDERNESS
COVINGTON CREEK
LAKE MORTON
S.E. BLACK DIAMOND RD.
GREEN RIVER
LITTLE SOOS
BIG SOOS
164TH AVE S.E.
CHURCH RD.
LAKE TAPPS
AUBURN
169
18
164

ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101
AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

GENERALIZED LOCAL
COMPREHENSIVE LAND USE PLANS

b

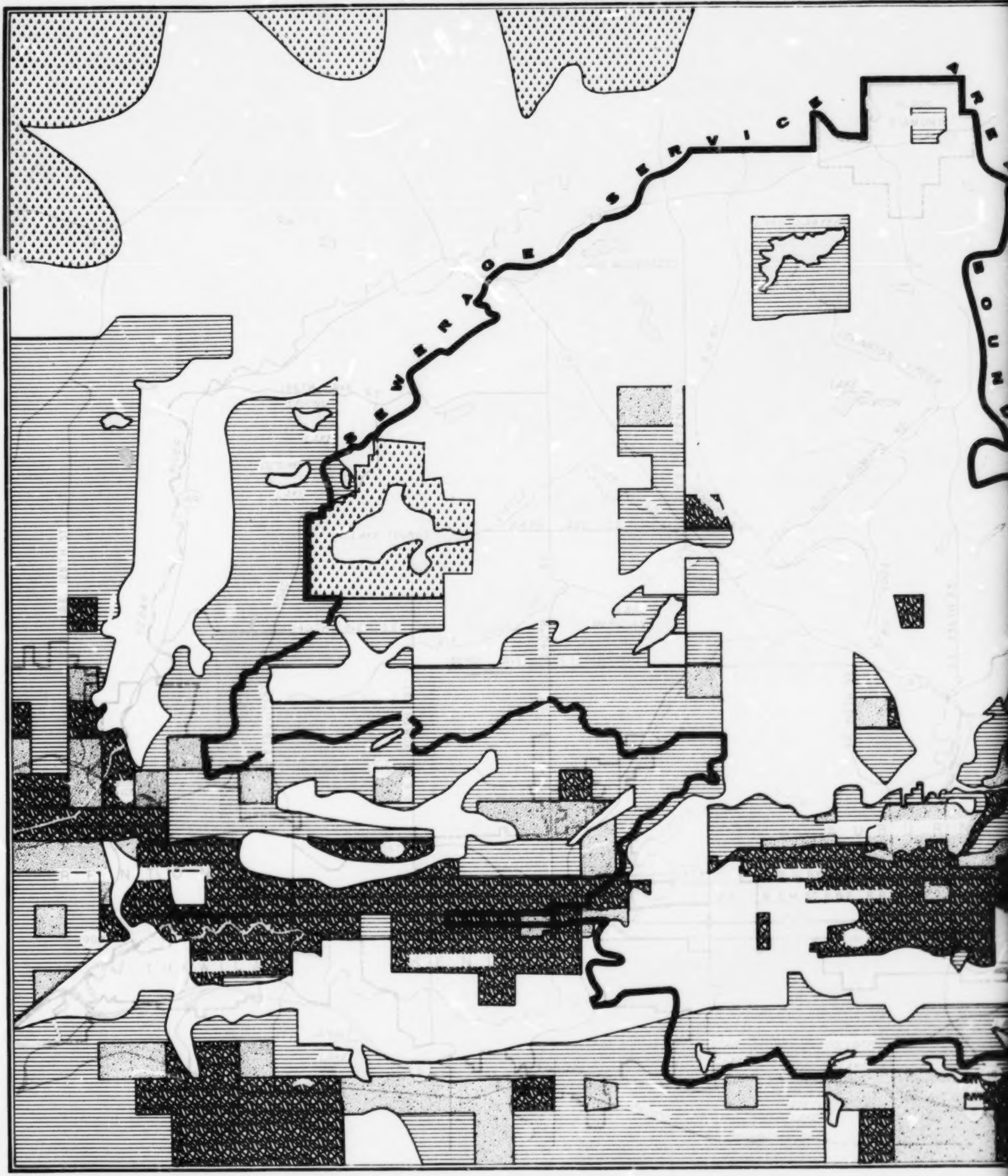
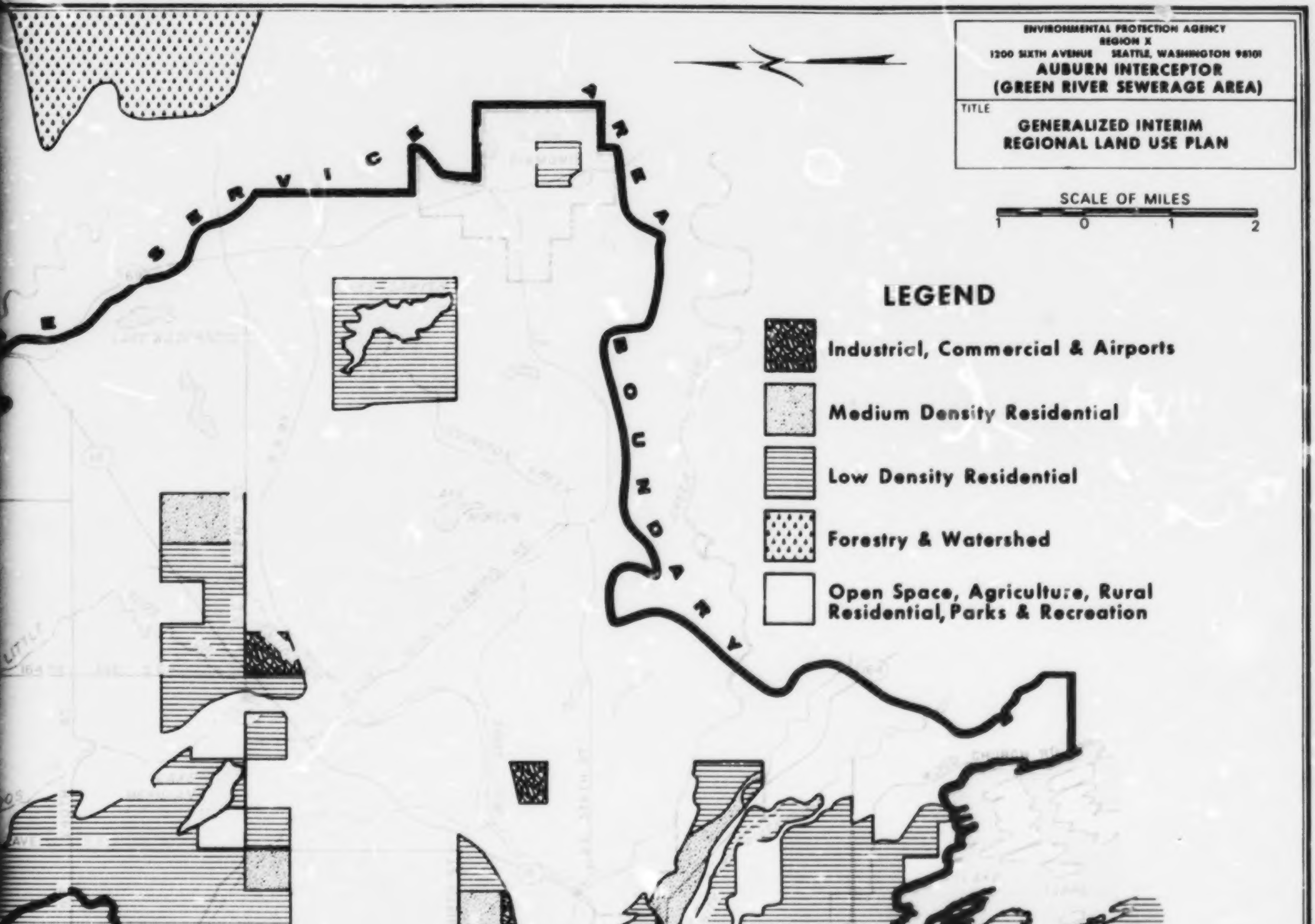

SEWERAGE SERVICE AR
BOUN

FIGURE 12

a



ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101
AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

GENERALIZED INTERIM
REGIONAL LAND USE PLAN

SCALE OF MILES
1
0
1
2
LEGEND
Industrial, Commercial & Airports
Medium Density Residential
Low Density Residential
Forestry & Watershed
Open Space, Agriculture, Rural Residential, Parks & Recreation
SERVICE AREA BOUNDARY
AUBURN
LITTLE

TABLE 23. COMPREHENSIVE PLANS - TOTAL ACREAGE

Land Use Category	Comp Plans Acreage	% of Area
Industrial	11,610	35%
Commercial	1,230	4%
Residential, SF	9,730	29%
Residential, MF	2,070	6%
Public & Institutional	760	2%
Parks and Recreation	500	2%
Non-Urban Land Use	7,420	22%

TABLE 24. ACREAGES FROM ZONING AND COMPREHENSIVE PLANS

Land Use Category	(1973 Zoned Acres) Zoning	Comprehensive Plans
Industrial	10,460	11,610
Commercial	1,750	1,230
Residential, Single Family (Low-Medium Density)	11,440	9,730
Residential, Multi Family (High Density, Trailer Parks)	1,075	2,070
Public and Institutional	770	760
Parks and Recreation (Designated Open Space)	Zoned under Public-Institutionalized	
Agriculture, Open & Rural, Residential, Agricultural, Open Space	4,450	7,420
General (a King County Zone)*	190	nothing comparable

Source: Measurements of composite zoning and comprehensive plan maps of Green River Valley Study Area.

*General is defined by George McCallum of King County Land Use Management as a holding zone, land likely to be rezoned for higher, more developed uses.

In other words, the land set aside for industrial purposes in the Green River valley is enough to accommodate all of the manufacturing land use that can be expected to occur in the entire region by 1990 with 4,534 acres left to spare. This unused portion alone could accommodate all of the expected 1990 manufacturing land use in King County (2,390 acres).

From these studies it is clear that (1) more land is planned for industrial use than is zoned for it; (2) more land is zoned for single family residential use than is planned; (3) less land is zoned for agricultural-open space use than is planned; and (4) less land is zoned for high density, multi-family residential use than is planned.

The question, then, that can be appropriately asked is "Can the proposed interceptor be considered an incentive to urban development when land is already planned for intensive uses?" EPA recognizes that the proposed project per se is not the key to continuing growth in the area simply because alternative dispositions of sewer demand are possible. An absolute prohibition of incremental sewer service will stifle growth -- with whatever environmental damages or benefits it may confer -- but eliminating the Auburn Interceptor project will not. The answer to the question may be a matter of timing -- a long range view shows land already committed to industry but, at short range, the availability of sewers may allow local jurisdictions to hasten the rates of urbanization of the land.

If adverse impacts associated with uncontrolled urban growth is to be avoided, growth must occur at a rate that is consistent with a publicly supported growth policy that fully recognizes the potential impacts associated with such growth. The interceptor will increase the capacity of the sewerage area to accept development. In a positive sense, the interceptor will reinforce patterns of human activity which have developed in the sewerage area during the past decade. The development of new industry and business and an increased tax base can be viewed as beneficial long term effects of the proposed action. In contrast, urban growth will diminish the natural, rural character of the Green River Basin if urbanization is encouraged according to the level called for by present land use plans.

In summary, the proposed interceptor:

(1) will facilitate development in the Green River Sewerage Area.

(2) will enable the provision of sewer service to vacant lands or to land currently developed at low densities.

(3) may stimulate land prices as pressures to develop the area increase; major landowners, developers, and speculators will

be financially benefited by the construction of wastewater treatment systems, particularly sewage transmission facilities, and the induced urban development local governments may allow to occur.

(4) will provide local jurisdictions the opportunity to amend their local plans and zoning ordinances so that plans are consistent with growth policies and will allow plans to be implemented without the constraints imposed by inadequate wastewater collection and treatment systems.

If growth is allowed to proceed in an uncontrolled manner, any excess input can contribute to the overtaxing of natural (water, air) and man-made (transportation) systems. When such overloading occurs, pollution is the visible result.

Urbanization is inevitable in the Green River Sewerage area--all trends point in that direction. Urbanization does have beneficial effects; however, these effects are often overshadowed by serious social, economic, and other environmental problems associated with such growth. EPA fully recognizes that comprehensive solutions to these problems can be provided by proper planning.

REFERENCES

1 Corff, Nicholas J. and Jill T. Shapiro, "The Green River Valley: A Study of Demand, Capacity and Trends." Draft, September, 1974.

2 Beam, Brian, "The Green River Valley - A Discussion Paper," February 14, 1975.

SOCIO-ECONOMIC IMPACTS

IMPACTS ON EXISTING SOCIO-ECONOMIC ENVIRONMENT

Given the existing land use plans and the present planning framework, the provision of adequate waste water collection and treatment systems will be one factor in allowing urbanization to occur in areas that are presently undeveloped. If urbanization occurs in an uncontrolled manner, the unplanned location of major industrial, commercial, transportation, and residential facilities will have a direct impact on the nature of neighborhoods, the opportunities for work and leisure, and the quality of natural resources.

Like environmental costs, the public costs associated with increased urbanization can be substantial. Sharp increases in population will lead to increased demand for additional public services, such as schools, fire and police protection, and other utilities. These costs of providing services, facilities, and utilities to developing areas presently accrue to the taxpayer.

Additional congestion, for example, created by the increased development within the Green River area, could overtax the existing circulation systems, requiring the construction of new transportation facilities. The costs associated with controlling the increase in runoff and surface ponding induced by urban development, are quite high.

Since industrial and commercial development will be made possible, long-term employment opportunities will increase in the sewerage area. While this, in itself, provides long term benefits to the people, the construction of proposed projects such as the Auburn 400 Shopping Center, which is contingent on the construction of the West Valley Interceptor, could have adverse economic effects on the existing "downtown" shopping districts in Auburn and Kent. Although the tax base in these central business areas may decrease, the tax base of Auburn, Kent, Algona, and Pacific should, in an overall sense, increase.

The construction phase of the project is expected to provide about 160 man-years of employment over the two year construction period. Once the project is completed and put into operation, it will reduce the number of man-years of employment required to supply sewerage service to residents of the valley by about 0.4 man-year per million gallons of sewage throughput, as opposed to providing sewerage service through individual community systems.

Studies of employment and population trends in the valley indicate that total employment is increasing two to three times faster than population. B. Beam[1] indicates that if trends that characterized 1961-1970 continue to influence growth to 1990, employment opportunities will continue to increase in the valley. As shown in the forecast in Table 25, manufacturing will account for 46% of the total employment in 1990. Retail employment is expected to increase significantly between 1980 and 1990 with the anticipated construction of the Auburn 400 Shopping Center.

As previously discussed (see section on Land Use Impacts), the proposed project is only one of a number of alternative engineering configurations that could supply the same services and provide the same capacity for expansion. The stage for urbanization is already set and the incentives to develop are many.

The Green River valley is a logical and favorable site for development. It offers developers buildable land which is in close proximity to major cities. Topography and physiography are such that they offer little constraint to development. The large parcels of vacant land in the valley provides the "elbow room" which developers find desirable. While the tendency of new development will be to spread out rather than up, increases in land costs should contribute to higher density development. Development incentives provided by employment opportunities and easy accessibility continue to increase the area's tax base, but also tend to increase pressures on existing public facilities.

For example, increasing student enrollment in the Kent School District 415 places greater pressures on schools that are presently operating at saturation levels. Although schools are already operating at 5-10% above program capacity, the Kent School District is experiencing an approximate 2.5% annual increase in enrollment. Although national trends reflect decreases in birthrates, the Kent School District does not anticipate a visible local decline for a while. These enrollment increases are unique to Kent and other areas such as Kirkland and Redmond. The general trend has been a decline in student enrollment.

In the Auburn School District 408 the visible trend has been a decrease in enrollment since 1969. Although secondary levels are at or slightly beyond capacity, the elementary levels have been on a negative trend that is expected to continue.

The anticipated growth will, therefore, have a greater impact on Kent's schools than Auburn's. Although school districts have planned for growth from the standpoint of site preparation, low success of building bond issues can inhibit the expansion of facilities.

TABLE 25 . GREEN RIVER VALLEY

POPULATION AND EMPLOYMENT FORECASTS[1]

YEAR	TOTAL POPULATION	TOTAL EMPLOYMENT	RETAIL	SERVICES	MANUFACTURING	WCTU	GOVERNMENT EDUCATION
1961	34,441	8,509	1,847	1,031	2,082	1,037	1,161
1970	58,382	30,076	4,471	2,555	14,663	4,603	3,784
1980	64,807	43,054	6,207	3,270	22,113	6,236	5,228
1990	78,394	62,223	11,541	6,356	28,381	9,193	6,752

Of primary concern in the discussion of the socio-economic impact are the following issues: (1) Is the policy decision to resort to centralized treatment in fact cost-effective and (2) is the scale of the project overly ambitious?

These issues are essentially economic since they do affect sewer charges for residents of the metropolitan area and also the amount of state and Federal budget outlays for sewerage purposes. Excessive expenditures for sewerage can have unfortunate social ramifications due to the essentially regressive nature of sewer service charges (burden on the payee is inversely related to income) and the high level of demand for governmental outlays for social services.

The proposed interceptor will allow for timely, well-planned growth without excessive new costs through the orderly phased extension of sanitary sewerage services.

While the question of separate or centralized sewage treatment is answerable on technical merits, the question of project size is less certain.

Adopting the Puget Sound Governmental Conference projections of population through the year 2000, Metro has designed for a population consistent with that projection:

TABLE 26. PROJECTED CENTRAL PUGET SOUND POPULATION

	1000's OF PERSONS			1970 - 2000
	1970	1990	2000	GROWTH RATE
Seattle	525.6	453.2	428.5	-0.7%
Other King County	538.5	812.1	915.6	1.8%
Pierce and Snohomish Counties	800.9	1150.7	1408.0	1.9%
Project Area	72.0	175.0	271.8	4.5%
TOTAL	1937.0	2591.0	3024.0	1.5%

The population projection for the year 2000 fails to take into account the pronounced reduction in population growth that has taken place in recent years. In the Seattle area (and to a significant degree, the State of Washington) growth in the post-war period was extraordinarily related to a single industry, aerospace. The decline of that industry since 1968 has caused a reversal of Seattle area growth that does not appear to be reflected adequately in the projection of design population:

TABLE 27. ANNUAL RATES IN KING COUNTY VS. WASHINGTON

	KING COUNTY	WASHINGTON
1950-60	2.4%	1.9%
1960-70	2.2%	1.8%
1970-73	-0.4%	0.2%

The national rate of population growth has been declining without interruption since 1957. Birth rates, with interruptions imposed by the age distribution of population, have also generally followed a negative trend. The fertility rate has been below the population replacement level in each year of the 1970's. Since continued population growth in Puget Sound is not inconsistent with static or declining national population, the design projections seem disproportionately ambitious and do not appear to adequately reflect national demographic trends.

The discrepancy becomes very obvious if the Puget Sound Governmental Conference population projections for Central Puget Sound that served as the basis for Auburn Interceptor design are compared to the Office of Business and Economic Research Services' 1973 distribution of the preferred (Series E) Census Bureau projection of national population. (OBERS' projections are for the Tacoma and Seattle-Everett SMSA, substantially the same region as PSGC's Central Puget Sound area.).

TABLE 28 . COMPARATIVE POPULATION PROJECTIONS THOUSANDS OF PERSONS

	OBERS			PSGC	Difference
	Seattle-Everett	Tacoma	Total		
1950	847.4	276.8	1124.2	1196	71.8
1960	1107.2	321.6	1428.8	1513	84.2
1970	1421.9	411.6	1833.5	1937	103.5
1980	1522.1	385.9	1908.0	2227	319.0
1990	1690.9	409.6	2100.5	2591	490.5
2000	1822.4	424.6	2247.0	3024	777.0

The significant differences indicate that there may be problems with both sets of figures. It is appropriate to emphasize that the PSGC figures are, at this time, the best available for the small area which encompasses the Green River Sewerage Area.

Another issue that deserves attention is the incremental energy demand that will result from the proposed project. The critical issue is not energy consumption per se, but the difference in energy consumption resulting from the various possible development configurations that will occur if the proposed action is or is not implemented. The critical issue is further limited to be net increments in fuel consumption associated with population and industrial growth if the growth should occur in the Green River valley or elsewhere in the Seattle Metropolitan area or in the Pacific Northwest. Given the overall level of development opportunities in the Seattle-Everett SMSA, development of the Green River valley, with or without the Auburn Interceptor, is neutral with respect to energy consumption in competition with other parts of the SMSA, and is superior in energy terms to additional development in other places such as the Snohomish and Puyallup valleys.

IMPACTS ON HISTORIC AND ARCHAEOLOGICAL SITES

The National Historic Preservation Act (16 USC 470) and the Archeological and Historic Preservation Act (16 USC 469) require, for a Federally-assisted project such as the proposed Auburn Interceptor, an evaluation of potential impacts on historic properties.

Identification and evaluation of national and state historic sites in the Auburn area revealed only one site in the area of possible direct impact. Further evaluation of the potential for impact on this site, the Seattle-Tacoma Interurban right-of-way, and consultation with the State Historic Preservation Officer, resulted in the determination that the proposed project would have no permanent impact on this historic site. Because the interceptor will be underground, with grade-level manhole covers being the only visible evidence of its presence, it will not have a permanent impact on the aesthetic, openspace, or historic values of this site. Any impact during construction will be temporary since disturbed surface areas will be restored.

Requirements exist for a similar evaluation of potential impacts on archeological sites. Although there are no known archeological sites along the proposed interceptor route, an archeological survey of the route will be performed. Should any sites be identified in this survey, or should anything of archeological significance be discovered during construction, appropriate procedures for preservation will be followed.

Indirect impacts on historic properties in the proposed service area need not result, since appropriate local land use controls could preserve the historic value of these sites, should residential or commercial development threaten them.

REFERENCES

1 Beam, Brian, "The Green River Valley - A Discussion Paper", Draft, February 14, 1975.

WATER QUALITY IMPACTS

EFFECTS OF THE PROPOSED ACTION ON WATER QUALITY

The primary impacts of the proposed action result from the elimination of a source of nutrients and biochemical oxygen-demand at Auburn and subsequent increase in waste discharges at Renton outfall, about 21 miles downstream. In addition, primary impacts include those resulting from construction activities along the interceptor corridor.

GREEN-DUWAMISH RIVER

With construction and operation of the Auburn Interceptor, the existing Auburn Sewage Treatment Plant will cease operation. With all waste intercepted, there will no longer be a potential for release of wastes during upset conditions, which might have a detrimental effect during low river flow. Lagoon discharges, averaging about 590 pounds of BOD_5 per day in 1974, will cease. This along with the corresponding nutrient reduction may result in some slight, beneficial impact on water quality in near-term. During low flow, dissolved oxygen depressions, which appear to be primarily due to benthic algae, and temperature/saturation dissolved oxygen relationships, may occur less frequently. However, upstream sources of nutrients and high stream temperatures would persist and little improvement may occur in the reach between Auburn and Renton. Little change would be expected in the bacterial concentrations in the river. The major sources of coliform organisms are associated with runoff and, in general, would probably not be eliminated by an interceptor.

Although operation of the Auburn Interceptor will divert some flow from the upstream reaches of the Green River, the impact of this diversion on the critical low flow conditions should be insignificant. During months when the river flow reaches critical levels (about 150 cfs), the Auburn Lagoon would typically add only about 3 cfs (2 mgd) to the river or 2% of the flow. Peak lagoon discharges (about 7 mgd or 10 cfs) occur during the winter months when river flows are river flows are much higher (over 1000 cfs).

The very slight impact on low flow conditions, by eliminating the Auburn Lagoon discharge would be further reduced, if low flow augmentation procedures at Howard Hanson Dam were instituted. (See p. 113A) Such augmentation has been cited at the only realistic alternative for improving temperature and dissolved oxygen problems in the upper part of the Green River and has been recommended for water quality improvement in the Duwamish estuary.

Intercepting Auburn's waste will increase waste discharges to the Green River from the Renton Sewage Treatment Plant. The wastes will receive a higher degree of treatment before discharge because the Renton plant removes 96 percent and 95 percent of the suspended solids and BOD in flows which do not exceed the dry-weather design capacity, 36.0 mgd[2]. (The DOE notes that the plant has a high BOD removal efficiency apparently because of the high sugar content of whey waste from two major dairies). Currently, the plant can provide secondary treatment for an average dry-weather flow of 36.0 mgd and a peak flow of 96 mgd. Average flows at the Renton plant during June 1973 through March 1974 were 26.1 mgd. Discharges of BOD_5 and suspended solids averaged 765 and 1630 pounds per day. Influent BOD_5 was equivalent to that from a population of 201,600 although the actual population served was about 159,000 according to the 1973 NPDES permit application.[3]

A comparison of the effluent quality for the Renton and Auburn facilities is shown in Table 28A. Data were provided by Metro. Although limited data were available for the parameters shown in the table below (with the exception of BOD_5), for the Auburn plant, the data shown for Renton reflect the 1974 annual averages. For Auburn, the months of September, October, and November 1974 are represented. Poor BOD removal efficiencies were experienced by the Auburn facility during part of this time.

Table 28A. Effluent Quality of the Auburn and Renton Treatment Plants

Parameter	(Pounds per million gallons per day) AUBURN	RENTON
Suspended Solids	737	62
Chemical Oxygen Demand	1594	435
BOD_5	307	38
Phosphorous	93	30
Ammonia-Nitrogen	157	87

Flows for the Renton plant averaged 26.1 mgd and for the Auburn plant were about 2.1 mgd.

Data for bacterial quality of the Renton treatment plant effluent has been summarized by Metro in Table 28B. The secondary treatment standard for fecal coliform monthly averages was met throughout the year.

Table 28 B. Summary of Monthly Average* Coliform Concentrations in the Renton Treatment Plant Effluent--1974

	Total Coliform	Fecal Coliform
Average	462	13
Maximum	2800	24
Minimum	24	3

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*Geometric Mean

As the influent loads to Renton increase, an additional aeration channel will begin operation. This would reduce the need to discharge during peak flows a portion of the effluent that has undergone only primary treatment and chlorination. The Renton plant can adequately treat the additional waste loads from the Auburn area, and can accomodate future expansion and/or the incorporation of advanced treatment facilities, if necessary, in order to meet the goals of the 1972 Water Pollution Control Act Amendments.[2]

In summary, the additional discharges at Renton from the Auburn area should have insignificant near-term impacts on the Green River downstream or on the Duwamish. The Renton Sewage Treatment Plant will provide a higher degree of treatment to waste loads which would have entered upstream. Also, the additional effluent at Renton would initially be a relatively small percentage of the existing discharge. Intercepting Auburn's waste may have some beneficial impact on the Green River between Auburn and Renton, but it is likely that violations of State water quality standards for dissolved oxygen and total coliform bacteria would continue to occur.

Secondary impacts of the Auburn Interceptor are dependent upon anticipated extensions of the Auburn sewerage systems to serve existing needs and future growth.

By providing the opportunity for additional connections to the Auburn sewerage system, the Auburn Interceptor will, in effect, ultimately increase the waste loads discharged at Renton as existing residential, industrial, and commercial needs are accommodated and as future needs due to growth are satisfied. In the year 2000, for example, some adverse impacts could occur in the Duwamish River, if the Renton plant is operated in future as it is now.[4] This conclusion is based on studies undertaken by RIBCO.

RIBCO used mathematical models to simulate expected water quality impacts. Their study was based on the following assumptions: 1) the waste loadings from land uses will correspond to the Puget Sound Governmental Conference's Interim Regional Development Plan land use projections, 2) that the Auburn Packing Plant (now out of business) would connect to the sewer system, 3) that the existing 113 cfs diversion of water to Tacoma from the upper Green River would continue, 4) that the Howard Hanson Reservoir levels would be managed carefully, and 5) that no changes in water use would occur.

In the RIBCO study, uses of the Green River upstream from Renton are not expected to suffer from unacceptable water quality in the year 2000 during low flows. Although wastes discharged to the Green River Drainage Basin would increase by the year 2000 with changes in land use, no decreases in the Green River water quality are expected.[2] These increased wastes would be associated primarily with urban run-off. Smaller streams will be more affected by urban run-off than the Green River.

The Auburn Interceptor would not significantly impact the Duwamish estuary water quality in the near-term. Over the long-term however, there may be adverse secondary impacts from continued growth. There are three areas of concern as determined by the RIBCO studies. The first is that the Renton effluent, including Auburn's wastes, will become a relatively large part of the low river flow as growth of the Green River sewerage area increases.

The average dry weather flow of the Renton effluent is estimated to become about 80 mgd by 1980, 110 mgd by 1990, and 138 mgd by the year 2000.

During critical low-flow conditions in the year 2000, the estimated dry weather flow from the Renton plant will be over half the river flow about once in two years[4], if there is no flow augmentation from Howard Hanson Dam. If no action were taken, fish would suffer acute toxicity from the chlorinated effluent. Metro has made acute toxicity bioassays using fingerling coho salmon. Of the test fish, 50% survived 24 hours exposure in a mixture of 33% Renton effluent and river water taken upstream from the discharge (chlorine residual concentration -0.23 mg/l). Metro is presently dechlorinating the effluent by sulfonation to reduce the total residual chlorine which appears to be the major toxicant. Metro is also determining the lowest effluent chlorine residual that can be maintained and still meet coliform standards. Tests indicate that, at the dilutions studied, the residual chlorine is the major toxicant for acute effects. However, the chronic toxicity of other compounds not removed by dechlorination may be important. Metro is also testing for chronic toxicity.

Problems with chlorine toxicity are not unique to the Renton discharge and may occur, unrecognized, in other chlorinated municipal discharges. Various alternative methods of achieving satisfactory disinfection without residual chlorine toxicity in the effluent are under investigation elsewhere. Dechlorination systems are currently available to mitigate this potential impact.

The second concern with future Renton discharges is the depletion of oxygen in the Duwamish estuary. Projections of potential changes in water quality in a complex system like the Duwamish estuary are difficult to make because the changes will depend not only on the meteorological and hydrological conditions but also upon the type and quantity of microbial organisms present to decompose the wastes. Nitrogen-using microbial populations are normally present in municipal discharges. These bacteria use dissolved oxygen to decompose the nitrogen in ammonia and organic material. This process is called nitrification. In many natural streams, these microbial populations are small and, consequently, the over-all rate of oxygen removed from the stream due to nitrification is insignificant. However, if a large population of these nitrifying bacteria exists, oxygen removal will be more rapid.

RIBCO studies have assumed that, in the year 2000, a sufficiently large population of nitrifying bacteria would exist in the Renton wastes or in the estuary to significantly deplete the dissolved oxygen. Results of these studies indicate that by the year 2000, with no change in the operation of the Renton plant, the oxygen resources of the upper estuary may be insufficient to satisfy the demands caused by nitrification of ammonia and organic nitrogen in the effluent under critical conditions of low flow and poor flushing action.[1] Metro consultants have investigated three basic alternatives (see Table 29) and low flow augmentation has been recommended. Metro is evaluating these studies and the alternatives.

Also, Metro is evaluating results of another mathematical simulation of water quality in the estuary which was based on different assumptions. These assumptions make the nitrogenous oxygen demand in the estuary less significant so that the projected dissolved oxygen depression becomes less severe. However, potential toxicity problems from the ammonia in the effluent would still be of concern. Consequently, it seems likely that, in future years, increased growth will make changes in waste treatment at Renton necessary to preserve water quality goals. Low-flow augmentation or slower growth than anticipated could delay the time for instituting these changes in the absence of regulatory requirements.

Low-flow augmentation of the Green-Duwamish River discharges has been recommended in the RIBCO studies to improve the lower Duwamish by dilution of the Renton treatment plant discharge, reduce the maximum temperatures in the Green River and increase the saturation dissolved oxygen (See Table 29). (Planting of shade trees was also considered to improve the temperature of the river, but further investigation was thought necessary before this approach could be recommended.) Because modifications to Howard Hanson reservoir would be required, participation of the Corps of Engineers must be sought by a local agency that is willing to sponsor the project. Application to the Department of Ecology for the necessary water rights must also be made. After receipt of the local sponsor's request, the Corps of Engineers would study the project feasibility. This would typically include: 1)Determination of project benefits 2) Solicitation of EPA views regarding the need, value, and impact of the proposed water storage project pursuant to Section 102 9(b) (3) of PL 92-500; and 4) Hydrology and reservoir operating rules.

Low-flow augmentation was estimated by RIBCO to have capital costs of $5 million and annual operation and maintenance costs of $30,000. Modifications required at Howard Hanson reservoir, involve the intake structure, cleaning of reservoir banks and minor relocation of an existing railroad. An additional conservation pool of 70,000 acre-feet, could then be filled following flood control operations in early spring each year. Water released during the summer from this additional reservoir pool could augment low flows during two or three months. However, there may be additional demands for this water. (See p. E-11 for additional discussion)

TABLE 29. COMPARISON OF ALTERNATIVES TO REDUCE FUTURE DISSOLVED OXYGEN DEFICIT IN DUWAMISH RIVER

ALTERNATIVE SOLUTION	COST ($$10^6$) CAPITAL	COST ($$10^6$) O & M	IMPACT
Nitrogen removal at Renton treatment plant by			Improve future D.O. in estuary to near saturation concentrations.
Nitrification	15.4	2.5	May increase magnitude of phytoplankton bloom in Duwamish (nitrification only).
Lime addition (including sludge handling)	11.0	0.5	
Transport effluent to Puget Sound	21.5	0.3	Improve future D.O. in estuary to near saturation concentrations. Elimination of any constituents which may be discharged to Duwamish.
Low flow augmentation	5.0	0.03	Dilutes nitrogenous BOD such that future D.O. in estuary is 5.5 mg/l. May reduce size of phytoplankton bloom in lower estuary. Will cool the Green River 3 to 5°F.

THE INTERCEPTOR CORRIDOR

Construction of the Auburn Interceptor may have short-term, adverse primary impacts on water quantity and quality along the interceptor path. These impacts, which include effects from dewatering of the trench and crossing of drainage channels and the Green River, are reversible and efforts will be made to mitigate them through compliance with existing regulations and through specifications in the contract for construction.[5]

Long-term, adverse impacts on groundwater or surface water should not occur along the interceptor corridor because special construction techniques will minimize infiltration, conduction, exfiltration, and bank and streambed erosion in order to comply with applicable regulations, grant conditions, and construction contract specifications.

No beneficial impacts on water quantity or quality along the interceptor corridor are expected to result from the construction process. The only beneficial impacts along the corridor from the operation of the interceptor are those which will improve water quality of the Green River. This is discussed in the section on the Green-Duwamish River.

The following discussion outlines the probable impacts of the proposed action on the water quality and quantity along the interceptor corridor. Where high water tables persist during the construction season, the trenches dug for the interceptor installation will probably fill with water.[2] The water must be pumped out of the trenches and disposed of. Disruption of the soil during construction will create turbidity problems in the groundwater locally and in the water which must be removed from the trench. These waters must be properly disposed of to prevent adverse effects on the receiving streams. What controls are used in each instance will depend on associated regulations. Controls that could be used include screened wells to prevent intake of soil particles by the dewatering pumps, sedimentation basins to remove suspended solids before discharge to streams, effluent monitoring, and pipe outfalls and diffusers to reduce soil erosion and ditch bank slumping. The grant applicant has stated that spawning channels will be protected by using sedimentation basins, by periodic monitoring of the dewatering near the wetland near South 277th Street.[2]

During dewatering of the trench, the local groundwater table will probably drop slightly, but this should have no adverse impact on the nearby wells because the deepest trench excavation required is less than thirty feet and the shallowest wells near the proposed corridor range from forty-nine to sixty-five feet.[2] Locally, the short-term impacts increase groundwater turbidity and water level decrease would be expected but this should not affect water supplies from wells near the interceptor corridor.

After the interceptor pipe has been laid, conduction and infiltration could affect groundwater quantity and exfiltration through cracks or breaks in the pipe could affect groundwater quality. Groundwater may tend to be conducted along the pipe through the porous material used as bedding and backfill, thereby draining saturated, fine-textured soils. Natural drainage for areas could be altered due to the diversion of water and conduction of excess water along the pipe to lower elevations. Conduction effects will be minimized by periodic backfill of fine-grained material to prevent flow along the trench.[2]

Infiltration of water into the pipe should have an insignificant impact on groundwater quantity. Infiltration can be a problem because excess, additional volumes of water require treatment. Materials and methods used to construct the Auburn Interceptor will minimize infiltration. Most infiltration, carried by the Auburn Interceptor, is likely to originate in the small collector sewers. In a Seattle area study, the newer collection systems were reported to have infiltration-inflow rates eleven hundred and four hundred twenty-five (1100 and 425) gallons per sewered acre per day during wet and dry weather, respectively. These quantities reflect both groundwater infiltration and surface inflow. Infiltration into the Auburn Interceptor is expected to be less than the allowable limits set by EPA even after some deterioration of the pipe.

Exfiltration is the movement of sewage out of the pipe through cracks or breaks. All of the Auburn Interceptor pipe joints must be tested for leaks. The limit on allowable leakage is less than 0.5 gallons per hour per inch of pipe diameter per 100 feet of pipe. If much greater pressures exist inside the pipe than outside, exfiltration could occur. If this occurs, groundwater quality could be adversely affected.[2] However, the inspection and testing procedures in this project are designed to minimize this possibility.

Crossing watercourses may have short-term adverse impacts but no significant ones are expected either in the long- or short-term. Short-term impacts that may occur include pollution from oil and grease, siltation, and erosion. However, contract specifications and compliance with the requirements of regulatory agencies will minimize impacts on water quality and aquatic life. For example, the crossing of the Green River will follow the stipulations imposed by the Department of Fisheries to protect spawning conditions; the Department of Ecology will make routine construction inspections.

OTHER CREEKS AND LAKES

Sewer service may have beneficial short-term impacts on the water quality of other streams and lakes in the service area. However, long-term effects are difficult to determine. The increased density of development accomodated by the proposed project may cause adverse impacts. Both short-term and long-term impacts are difficult to quantify because they result from diffuse sources rather than point discharges of pollutants. Providing sewer service to areas which now rely on improperly sited or poorly functioning septic tanks that drain into lakes or streams or the water table, may have an immediate beneficial effect on the ground and surface waters by removing nutrients, oxygen-demanding substances, bacteria, and viruses. Possible health hazards from septic tank effluent appearing at the ground surface or entering water supplies should be reduced as sewage is provided.[6] Inadequate septic tank systems likely contribute to the unsanitary conditions and may also contribute to the accelerated aging of some lakes. When sewage is provided to these areas, the rate of eutrophication may decrease and sanitary conditions may improve. Whether or not the long-term secondary effects from urbanization will offset these anticipated benefits is difficult to determine.

In general, unplanned urbanization will produce several types of interrelated impacts on watercourses.[7,8] These impacts are primarily due to the increased runoff from impervious surfaces as with higher density developments. Urbanization can affect hydrology by altering: 1) the quantity of runoff, 2) the peak flow characteristics of streams, 3) the water quality, and 4) the aesthetic value of water courses.

How much runoff results from precipitation depends on the infiltration characteristics of the land. These in turn, depend on the slope, the soil profile permeability, the vegetative cover, and the percentage of land covered by impervious surfaces, as streets, roofs, and parking lots.

Peak flows from rapidly draining impervious surfaces can have several adverse effects. With increased urbanization, these peak flows in small streams tend to be higher than under natural conditions. The total quantity of runoff is also greater, because more of the rainfall runs rapidly over impervious areas without infiltrating into the soil. As a result, increased storm runoff can severely affect the small streams, eroding and widening the banks and destroying aquatic habitats. The high level of pollutants that washes off the urban areas and the increased sediment load from erosion create further problems for aquatic life, such as siltation of spawning beds and smothering of bottom organisms. Overbank flooding becomes a more common occurrence.

Because runoff increases, groundwater storage and soil moisture decrease; low flows become more pronounced because the moisture storage which would normally recharge the stream is reduced. During low flows, streams experience depletion of dissolved oxygen as stream temperatures increase, due to the shallower depths in the widened, eroded channels and, in some instances, the loss of natural shading. The lower flows have less diluting capacity and less capacity to withstand contaminant loads. Construction sediments can also add to stream loads.

With careful planning, however, the potentially adverse impacts of urbanization can be reduced. Trapping runoff in offstream holding ponds to even out peak flows and reduce the floatable and settleable loadings can partially mitigate the effects of urbanization.[1] Other measures include land use controls, restrictions on structures in the stream, special detention and treatment of runoff from large paved areas, and restrictions on the sale and use of pesticides, fertilizers, and toxic materials. Proper cleaning of streets and catch basins and regulation of construction activities can also reduce potentially adverse impacts on water quality.

The quality of urban runoff may adversely impact water quality if controls are not instituted. For example, there may be a long-term increase in nutrient input to lakes from fertilizers and other constituents of urban drainage. A local study found that the quality of one lake in the Seattle area, would probably not improve even if septic tanks were removed. The increased loads from urban runoff with the anticipated population growth would essentially negate any improvement from septic tank discontinuation.[9]

Urban runoff can also contribute to unsanitary conditions. High concentrations of coliform bacteria are found in some urban streams which traverse sewered areas. Thornton Creek, a stream outside the study area, is local example which has been studied. Table 30 shows some data on the quality of local urban runoff.[10]

If major developments install conventional storm drain systems without proper planning, the Big Soos Creek basin may experience increased erosion and flooding with damage to the salmon productivity and aesthetic values of the stream. Computer simulations found no improvement in bacterial loads in the Big Soos drainage in the Year 2000.[4] The two water quality simulations for the Green River Basin in the Year 1970 and Year 2000 had different point sources as well as land use conditions, which made it difficult to isolate the effects due to land use changes. However, the Big Soos drainage basin simulation affords an opportunity to examine the effects of urbanization in a case where point sources remained constant and the only major land use changes were from low to higher density residential. In the Year 2000, the nitrate loadings increased 33% and BOD concentrations more frequently violated the study criteria.

TABLE 30. URBAN RUNOFF POLLUTANT CONCENTRATIONS IN THE SEATTLE AREA

Parameter	Single Family Residential View Ridge 1	Multi Family Residential View Ridge 2	Mean Concentration[a]/ Industrial South Seattle	Commercial South Center	Single Family Residential Lake Hills	Single Family Residential Highlands	Commercial Central Business District**
Temperature, C°	13.1	12.9	14.8	13.3	14.6	10.7	16.6
Conductivity, umho/cm	125	136	134	99	51	132	210
Turbidity, JTU	30	37	47	18.7	15	22	43
Dissolved Oxygen	8.6	8.9	8.5	9.5	9.6	9.4	7.0
BOD	30	30	19	15	8.5	8.0	22
COD	95	97	95	70	68	57	66
Hexane Extractables	12	16	14	11	7.3	8.5	6.8
Chloride	7.7	12	12.2	6.6	5.3	7.5	24
Sulfate	17	18	26.1	18	7	18	25
Organic Nitrogen	2.6	3.5	1.7	1.4	1.4	1.4	1.1
Ammonia Nitrogen	0.32	0.48	0.32	0.32	0.19	0.09	0.88
Nitrite Nitrogen	0.11	0.12	0.06	0.04	0.03	0.02	0.12
Nitrate Nitrogen	0.67	0.72	0.83	0.64	0.51	0.76	0.72
Hydrolyzable Phosphorus	0.45	0.40	0.24	0.17	0.24	0.35	0.71

** Due to limited background data from this area, these values are approximate.

a. Concentrations are in milligrams per liter except as noted.

TABLE 3a (CONTINUED)

Parameter	Single Family Residential View Ridge 1	Multi Family Residential View Ridge 2	Mean Concentration[a]/ Industrial South Seattle	Commercial South Center	Single Family Residential Lake Hills	Single Family Residential Highlands	Commercial Central Business District**
Ortho Phosphorus	0.12	0.12	0.08	0.05	0.12	0.10	0.16
Copper	0.040	0.056	0.10	0.081	0.076	0.12	0.44
Lead	0.44	0.32	0.25	0.40	0.27	0.08	0.37
Iron	2.4	2.0	2.1	0.75	0.39	0.44	2.0
Mercury	0.0003	0.0004	0.0004	0.0008	0.0003	0.0008	0.0005
Chromium	0.025	0.009	0.010	0.074	0.010	0.010	0.28
Cadmium	0.005	0.004	0.005	0.004	0.004	0.004	0.013
Zinc	0.18	0.12	0.43	0.24	0.082	0.068	0.86
Sett. Solids	51	84	60	40	40	68	113
Susp. Solids	85	112	80	73	54	98	190
TDS	134	125	170	89	72	101	208
Total Coliform* org./100 mls	28,000	26,000	4,200	1,600	37,000	1,600	4,600,000
Fecal Coliform org./100 mls	3,600	1,200	30	370	1,400	370	440,000

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* Median

** Due to limited background data from this area, these values are approximate.

a. Concentrations are in milligrams per liter except as noted.

BOD increased about 36%, ammonia nitrogen increased about 50%, and nitrate increased slightly when expressed in terms of pounds discharged per year. The phosphate and BOD criteria, established in the study, were violated more frequently and no improvment in the coliform loadings was found.[4]

The RIBCO studies also examined the effects of storm runoff on small streams. For this study, RIBCO used land-use configurations expected in the Year 2000 and the IRDP modified by drainage basin boundaries. Two of these drainage areas, the Black River and Mill Creek, are tributaries to the Green River. Drainage problems of both were expected to intensify.[8]

Problems of urban drainage are being recognized by local regulatory authorities; new regulations may help prevent the secondary adverse impacts from urbanized development which will be accomodated by the proposed action. For example, King County recently passed an ordinance requiring submission of drainage plans for any substantial development and, in general, requiring that peak flows not exceed those which would have been observed under natural conditions. Although additional controls may be necessary to prevent water quality problems, such measures indicate a recognition of the potentially adverse impacts. Another approach to problems of storm drainage has recently been instituted by the City of Bellevue. For the first time in the State of Washington, a storm and surface water utility authorized to charge fees for drainage was created.[22] Authority for this utility approach is found in Chapter 35.67 of the Revised Codes of Washington.

GROUNDWATER

The construction and existence of an interceptor from Auburn to Kent will have insignificant impact on the quantity and quality of groundwater in the valley. Where the excavation has to be dewatered during construction, there may be some lowering of the water table immediately adjacent to the excavation. As previously discussed, this condition would be temporary and local, and should not interfere with existing water supplies.

Secondary impacts of the proposed project would result from any changes in land use in Southwestern King County that could take place more rapidly when utilities are provided. These changes in land use, whether related to the interceptor, or not, will have effects on groundwater recharge and ultimately on conditions in the discharge area in the Green River valley. Land use changes consisting chiefly of extensive suburban development in the recharge areas on the uplands would be expected to:

1. Increase the total runoff from the area (runoff being the combination of both surface and ground water).
2. Decrease the amount of groundwater recharge.
3. Increase stream flow in the wet season.
4. Decrease stream flow in the dry season.
5. Result in a lowering of groundwater levels.
6. Result in a reduction in the flow of springs in the discharge area.
7. Result in the conversion of some wetlands to dry lands.

The above changes would develop over a long period and might not be readily apparent without detailed, long-term monitoring.

SEPTIC TANKS

The Auburn Interceptor service area, a large proportion of the present population (40% or more in Auburn) depends on septic tank systems. When these are situated on unsuitable soils and where high water tables exist, the septic tank effluent may rise to the ground surface and create unsanitary ponding.

Groundwater and surface waters can also be contaminated by percolation of subsurface drainage.

The high water table and soil conditions make much of the land in the area generally unsuitable for septic tank systems.[6,12] (See Figure 13). Although soils may be unsuitable, septic tanks, in some cases, can be properly installed. County regulations restrict construction of alternative individual waste treatment systems and require that drainfields and sewers by 48" above the high water table.[13] Recent regulations have denied the construction of drainfields on fill even though fill would raise such systems the required distance above the high water table. Some septic systems now in use are covered by standing water during flood periods. This creates a potential health hazard. Where improper systems create health hazards, the county can require ceasing operation.

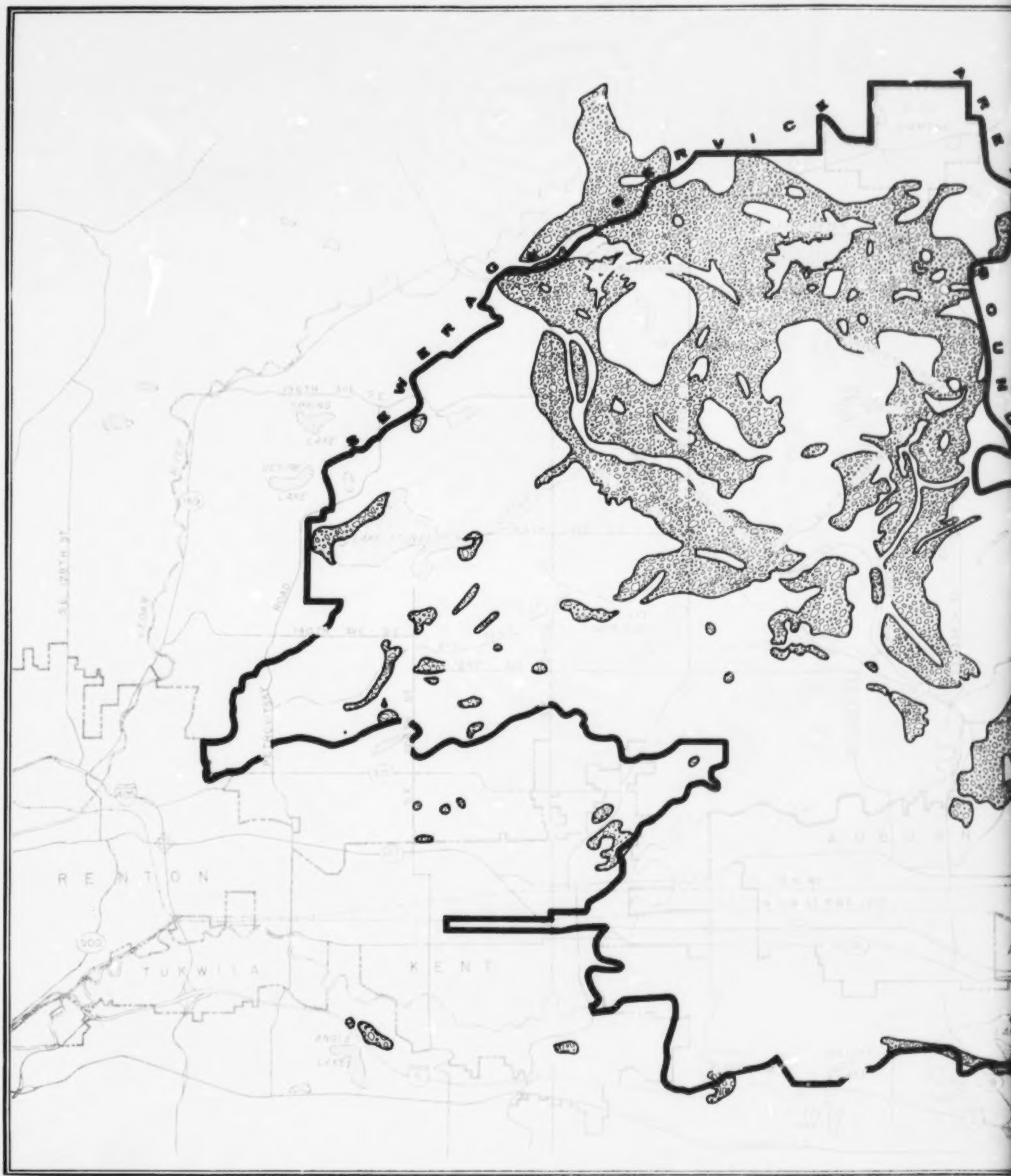
The potential for health hazards from septic tanks will be eliminated when Auburn extends sewer services to those areas having septic tank problems. Development can then proceed without needing to construct waste treatment facilities. Under the current constraints, these facilities must either satisfy regulations on subsurface disposal or satisfy regulations on discharge to surface streams.

SLUDGE

Sludge from the Renton secondary treatment plant will be pumped to Metro's primary treatment plant at West Point. Metro's sludge disposal policy, which is currently under evaluation in connection with their planning effort for meeting requirements of PL 92-500, calls for this method of sludge management. In the future, as a strategy evolves, optimal sludge management will be determined and may include future sludge digestion facilities at other locations.

After operation of the Auburn Interceptor, the sludge volume at Metro's West Point facility will increase slightly. Adverse impacts from sludge transportation and disposal are unavoidable at this time. However, the present methods are viewed as an interim solution. These may be altered when a final, long-term method of disposal is implemented sometime prior to 1983.

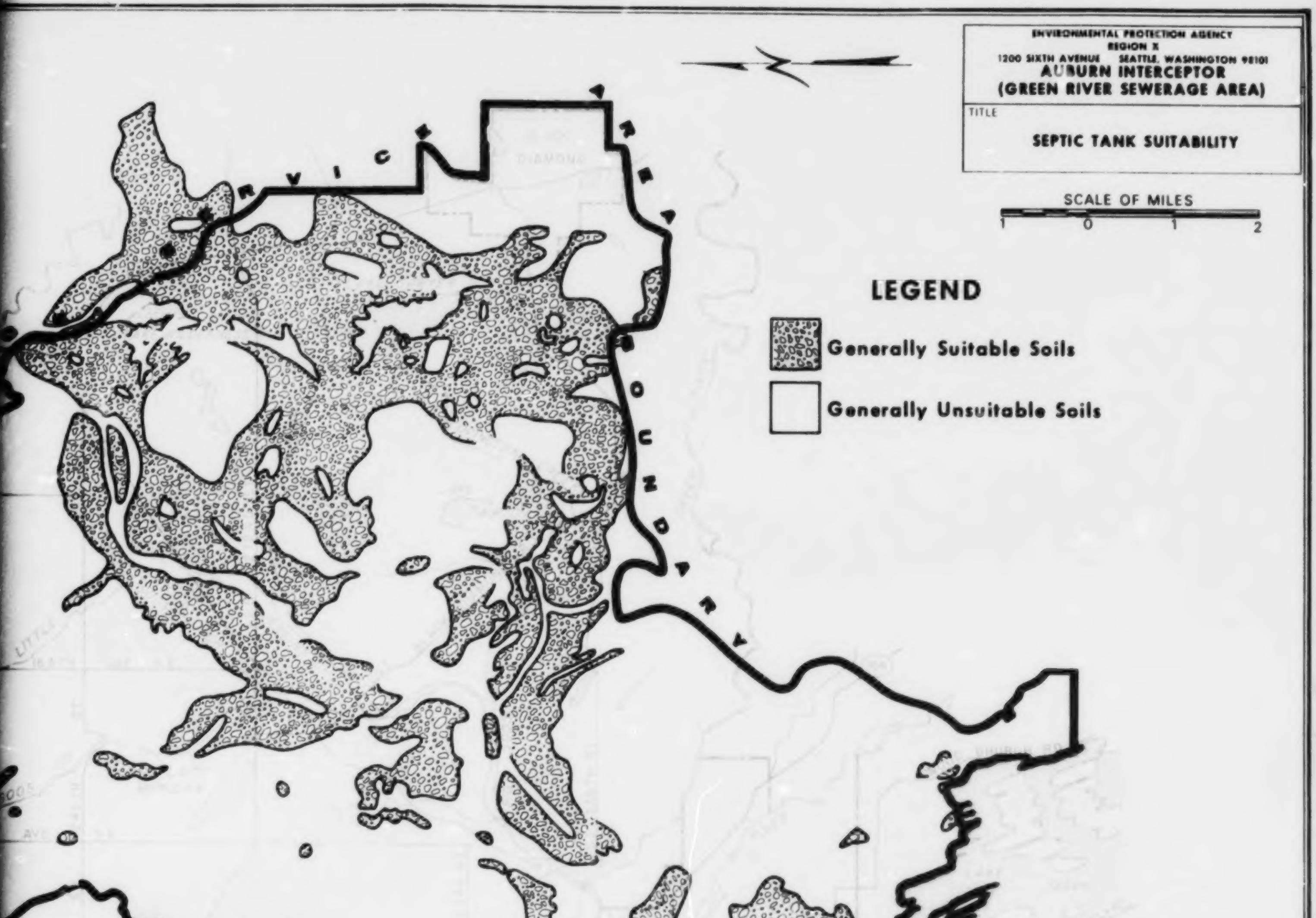
Transportation of sludge through the Discovery Park and the Magnolia community adversely impacts the noise environment. Impacts on air quality through vehicle emissions are relatively insignificant. Initially, the Auburn sludge will add about one extra truck-trailer load per week through the Magnolia District. In comparison, about 40 to 50 truck-trailer loads per week are now required for West Point sludge disposal. About 90% is hauled by truck-trailers of 16 to 21 tons capacity, but some smaller dump trucks are occasionally used.[14]



R E N T O N
T U K W I L A
K E N T
A U B U R N
ANGLE LAKE

a

FIGURE 13


LEGEND
▨ Generally Suitable Soils
☐ Generally Unsuitable Soils
SCALE OF MILES
1 0 1 2
RVICE AREA BOUNDARY
DIAMOND
AUBURN
PACIFIC CITY

ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101
AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

SEPTIC TANK SUITABILITY

Estimates of sludge volumes,[15] which are now being revised by Metro, indicate that Auburn will account for 2.2% of the total sludge output at West Point in 1977, and over 4.6% in the year 2000. (See Table 31). If Auburn sludge grows faster than the assumed 8% annual increase for the Renton system as a whole, then Auburn would account for more of the output in the Year 2000. For example, a 10% annual growth would increase the estimated Auburn contribution in the Year 2000 to 12.14 dry tone per day, or 7% of the total output at West Point. Transportation needs are based on a moist sludge cake of 20% solids (five times the dry weight).

Table 31. ESTIMATED SLUDGE OUTPUT AT WEST POINT[c]
(dry tons per day)

Year	Due to AUBURN AREA	Due to RENTON[a]	Total Output at WEST POINT[b]
1977	0.75 (2.2%)	9.84 (29%)	34.08 (100%)
1983 (8% Auburn growth)	2.14 (2.8%)	28.11 (36%)	77.24 (100%)
1983 (10% Auburn growth)	2.40 (3.1%)	28.11 (36%)	77.24 (100%)
2000 (8% Auburn growth)	7.88 (4.6%)	103.94 (60%)	172.73 (100%)
2000 (10% Auburn growth)	12.14 (7.0%)	103.94 (60%)	172.73 (100%)

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a. Renton system includes Auburn
b. Due to West Point system plus Renton system
c. Estimates assume 2% growth for the West Point system and 8% growth for the Renton system. Other assumptions are 1) West Point captures 60% while primary treatment is used 2) Digesters reduce volume 50% 3) West Point BPT multiplies sludge output by 1.8 4) additional treatment at Renton.

Until a long-term method of disposal is chosen, long term impacts from transportation and disposal of sludge due to Auburn cannot be evaluated. Because estimated sludge output at West Point in the year 2000 is about five times the 1977 levels, any long-term commitment to trailer-truck transportation, which adversely impacts the noise environment, seems unlikely.

In the near term, impacts of Auburn sludge on the ground and surface waters near the present West Point sludge disposal sites will be a small addition to existing impacts from present sludge volumes. Most West Point sludge now goes to a demonstration area at Pack Forest near Eatonville. Land application rates of as much as 100 to 200 tons per acre (dry basis) are being studied, with monitoring of potentially affected natural waters. So far, the spring discharging below the disposal area has shown no increases in metal concentrations or nitrogen levels that would be of concern, according to Metro.[16]

Some sludge from West Point goes to the King County Cedar Hills landfill which also receives many other kinds of solid waste. Adverse impacts on water quality from leachate discharge to a surface stream are apparent. Any adverse impacts due to Auburn sludge would be a relatively minor addition to the existing water quality problems for which solutions must be sought.

FLOOD AREAS

Evaluation of proposed, federally-funded projects that involve construction or development in flood plains must specifically consider flood-related impacts.[17] Evaluation of the valley areas that would be flooded during a 100-year event is complicated by several factors; 1) artificial regulation of the Green River flood flows 2) impaired drainage of some tributaries at high river stage 3) alteration of drainage by fill and construction; 4) a proposed, but not yet implemented, comprehensive drainage plan (SCS project) which calls for pumped drainage to discharge runoff to the Green River; 5) uncertainties regarding levee overtopping in some low-lying areas (particularly in Tukwila), and the ability of some existing dikes to endure permitted flood flows of the Green River with the addition of more pumped drainage; and 6) uncertainty regarding implementation of the Corps of Engineers Flood Control Study recommendations to increase the river channel capacity (improve the levee system). (See p. E-11)

A further complication is that, although a comprehensive drainage for the valley has existed for many years, a detailed definition of the extent of floodwaters during a 100-year storm for current conditions in the Green River valley has not been prepared. Floodproofing measures (such as fill), have altered the topography (and drainage) since the project was initiated. Although the approximate extent of the flood hazard areas was mapped for the initial phase of the HUD flood insurance program, this effort was not a detailed study. A second phase of flood hazard mapping is planned. Although much of Auburn was shown within the flood hazard area in the first phase of the HUD mapping, the City has contested this designation.

According to the SCS, for the 100-year flood, without the SCS pumped drainage, most of the valley floor would be subjected to floodwaters or severely impaired use under the existing conditions. The Corps of Engineers prepared a map for waters of the Green River during a 100-year flood. This map assumes flows of 12,000 cfs at the Auburn gage and added flows from operation of the proposed SCS pumped drainage project causing levee failures in some places. Some areas would flood when waters which overtop the levee or pass through a break are blocked from returning to the main channel by local topography and/or the levee system.

In the vicinity of the river crossing, the Auburn Interceptor will cross this estimated 100-year flood plain of the Green River and some frequently flooded areas. Present structural requirements in the area are generally based on protection from the 100-year floodwater elevations expected in drainage channels after the construction of the proposed SCS drainage system.[18,19] If the SCS project is not funded and no equivalent drainage system provided, the probability of flood damage to the interceptor would remain at about its existing level.

The Auburn Interceptor will allow the extension of Auburn's sewerage system to serve both current and future needs. In so far as provision of sewer service accomodates development, the operation of the interceptor may have a secondary impact in areas now subject to flooding by serving planned growth in these as in other areas.

Floods frequently innundate and damage the Green River valley. Reported damages for 1972 and 1973 totaled $109,000 for 43 problems in the Lower Green River, part of which is within the service area.[8] Damages on Big Soos Creek were $3,000 for 5 reported problems.[8] For Mill Creek, one of the study demonstration areas (which also lies within the service area), RIBCO estimated that annual damages from flood and drainage waters were $42,920 or $4,100 per square mile.[8] Major problems include extensive flooding of agricultural lands, extensive road damage, reduced crop yields, and damage to tributary and mainstream channels. However, future land use projections indicate that industry and commerce will eventually occupy much of the Valley (including the flood plain) and that suburban residential development will increase in the uplands and around urban centers.

With urbanization, storm runoff will increase because impervious surfaces cover more area. Open, unprotected areas will then experience greater flooding problems unless proper drainage facilities are provided.

Within the Green River sewerage area, the present problems are chiefly from poor interior drainage, rather than high-velocity floodwaters. RIBCO studies under the USCOE identified about 4600 acres in the sewerage area as present problem flooding areas, of which about 3500 acres are situated in the valley. These might be flooded fairly frequently (10-year frequency). For larger floods, as might occur once in a hundred years, most of the valley in the Auburn Interceptor service area would be subject to floodwaters or severely impaired use, according to the Soil Conservation Service. Floodproofing measures are required for developing much of the valley. Also a drainage project has been proposed, but is not yet funded. An environmental impact statement on this project is now being prepared.[19] (See Appendix E).

No land in the slide hazardous area was planned for development. Industrial-commercial and residential land use is planned adjacent to some slide hazardous areas.

Because of the high water profiles of the Green River and prevalent flooding problems in the valley, pumped drainage (such as the SCS West Side Watershed Project) would appear to be the only solution if the valley is to be extensively developed, according to the RIBCO studies.

RIBCO has proposed two approaches to urban drainage and runoff for the lower Green River area.[8] RIBCO's Alternative I, which does not consider onsite runoff control, adequately protects developed properties but disturbs many natural hillsides and valley streams. This approach rapidly disposes the larger quantities of runoff into the main channel of the Green River. Alternative II employs runoff control and relies on holding ponds (possibly including wetlands, bogs and lakes) in the upland areas to release runoff more slowly and provide more opportunity to protect natural streams. However, both alternatives utilize pumped drainage to accomodate the projected land uses in the valley. Another approach is to zone land uses to reduce potential economic losses. For example, by preventing construction of urban facilities in flood plains or areas of high flood potential, possible economic losses are minimized and future expenses for flood control may be reduced. The present approach is to fill construction sites and flood-proof buildings. Extraction of fill material from the valley walls could have adverse impacts on water quality and aesthetic values.

REGIONAL PLAN WITH STAGED INTERCEPTOR

The operation of an interceptor constructed in stages will have essentially the same impacts on water quality as the proposed action.

However, for the construction phase of each stage, the short-term, reversible construction impacts described for the proposed interceptor may occur.

REGIONAL PLAN WITH SECONDARY TREATMENT WORKS AT AUBURN

Primary impacts on water quality in the Green-Duwamish River from this alternative depend upon the reliability of the process selected and the quality and quantity of the effluent. Other primary impacts would result from construction of the physical facilities.

GREEN-DUWAMISH RIVER

In the short-term, the lower suspended solids from secondary treatment, though satisfying EPA's numerical criteria, may not significantly impact the Green River. Required monthly average removal efficiencies for biochemical oxygen demand would not be markedly different from the annual average presently achieved (85% vs. 84%). The chief potential beneficial, near-term, impact would be more consistent performance and a reduced possibility of discharges of inadequatelyreated wastes during critical low flows. Upgraded treatment will have little effect on the total coliform bacteria or nutrient concentrations in the river.

No significant near-term impacts on the Duwamish estuary from a secondary treatment facility at Auburn are expected because the upstream changes in average effluent quantity and quality would be relatively minor. Any reduction in the accidental discharge of inadequately treated waste would be a benefit, although other factors appear to more significantly affect the low dissolved oxygen problem in the estuary.

Long-term impacts depend on the realization of growth in the area and the increased discharges to the Green River. The year 2000 design flows; 35 mgd for annual average; 25 mgd for summer flow; and 55 mgd winter for peak flow; are slightly greater than the most probable average flows. To design adequate hydraulic capacity for physical components as pipes, a high estimate of infiltration/inflow into the sewerage system was used. However, lower quantities are considered more likely during the summer months. For the year 2000, the probable summer flow is 17.58 mgd (27.2 cubic feet per second) for the treatment plant designed for an annual average flow of 35 mgd.

Flow augmentation of the Green River from a secondary treatment plant at Auburn would have slight long-term, beneficial impacts on low-flow problems. During the summer months of critically low river flow (about 145 cfs), Auburn would probably add, by the year 2000, about 27 cubic feet per second (17.6 mgd) to the river. Although this would increase the volume for aquatic life, the resulting 19% increase in river flow would have no significant impact on temperature or dissolved oxygen.[20] For comparison, low-flow augmentations of approximately 550 cfs from a modified Howard Hanson dam, would probably decrease the maximum diurnal temperature from about 68° to 63°F and increase the saturation value of dissolved oxygen to 9.5 milligrams per liter.[1,4]

By the year 2000, summer discharges could be 4400 pounds per day of BOD, if effluent concentrations met secondary criteria (30 mg/l) and flows were 17.6 mgd. This may adversely impact downstream water quality by contributing to violations of the dissolved oxygen standard.

Impacts of a lesser waste discharge (about 2400 pounds per day of BOD_5 - summer) were simulated by RIBCO consultants, using IRDP land use patterns for the year 2000. Modeled river flows were about twice the one in 10 low flow of 145 cfs. According to the model, downstream at Tukwila, summer violations (about 7.3 mg/l) of the dissolved oxygen standard might occur in the year 2000. Because of the diurnal nature of the violations, benthic oxygen demands appear to be significant at this location. The largest decreases in dissolved oxygen due to BOD_5 from the Auburn waste would probably occur further upstream, only a few hours below the discharge point.

A simpler model was used to consider BOD and aeration for assumed river conditions and another waste load. For a slightly larger waste discharge (5200 pounds per day of BOD) and a lower river flow (150 cfs), dissolved oxygen decreases about 1.4 mg/l, which is below state standards. However, low-flow augmentation of about 300 cfs could increase the minimum expected dissolved oxygen by about 0.7 mg/l. See pages 109 and Appendix E for additional discussion of low-flow augmentation.

Because of expected high levels of nutrients from other sources and other constraints on algae growths, the additional nutrients from the Auburn facility may not significantly affect algal growths in the river between the discharge site and the Duwamish estuary. However, Auburn would be the principal source of increased ammonia in the lower river above Renton, discharging perhaps 3000 pounds per day during summer months.

Another concern with nitrogenous discharges, as ammonia, is their potential role in oxygen depletion. Excessive nitrogenous substances can cause a proliferation of decomposing, which can significantly deplete the dissolved oxygen supply. Discharge of nitrogenous wastes upstream at Auburn might significantly increase populations of nitrifying organisms downstream in the Duwamish estuary. If nitrogenous oxygen demands became significant, dissolved oxygen concentrations during critical low flows could be affected. However, at this time, comparisons of the relative effects on the estuary of discharged secondary wastes upstream (at Auburn) or further downstream at Renton are difficult to make. Some wastes would be assimilated during travel between Auburn and Renton. This would slightly reduce the total load entering the estuary in the year 2000. Based on RIBCO modeling, the summer discharges of ammonia at Auburn for a 13.8 mgd plant were about twice the summer river loads at Tukwila. However, significant nitrogenous oxygen demands may become more likely in the estuary.

During the warm summer months when water contact sports are more likely, high concentrations of coliform from upstream waste sources would result in violations of the state coliform standard above Auburn. The additional total coliform bacteria from the Auburn Treatment Plant would not significantly affect the downstream concentrations if secondary criteria are met. However, if chlorination continues, potentially adverse impacts may occur. Early investigation of possible chlorine toxicity could forestall this situation.

OTHER LAKES, STREAMS AND GROUNDWATERS

Implementing regional waste collection and treatment under this alternative would be similar to that for the proposed action. Consequently, with the exception of the Green-Duwamish River, the expected impacts on water quality would be the same as for the proposed action.

UPGRADED LAGOON

Upgrading the lagoon to meet secondary treatment criteria may have only a slight beneficial impact on Green River water quality in the near-term. However, this action does not provide sufficient additional treatment capacity to serve the long-term needs of the area. The long-term impacts of other waste disposal alternatives used to satisfy growth requirements cannot be foreseen.

GREEN-DUWAMISH RIVER

The application of physical-chemical treatment technology would improve the quality of the effluent, reducing the suspended solids and, to some extent, the oxygen-demanding wastes and nutrients. The primary beneficial impact on water quality would be a reduced probability of discharge of inadequately treated wastes during critical low-flows. In the near-term, downstream water quality improvements may be slight. Dissolved oxygen depressions would probably continue to occur in the river downstream. No improvement in total coliform bacteria would be expected.

OTHER LAKES, STREAMS, AND GROUNDWATER

Although some additional treatment capacity would be available, the Auburn plant would not have sufficient capacity to serve the long-term growth in the area. The capacity, 3.2 mgd, would provide an opportunity for serving some local needs, such as service to nearby areas in Auburn where septic tank problems are frequent. However, because service would not be extended to the entire area, there would be no impact expected on the existing septic tank problems in areas such as Black Diamond. These would continue to experience problems that, in some instances, may contribute to unsanitary conditions and accelerated eutrophication in lakes.

Long-term secondary impacts from additional growth would partially depend on how sewerage needs are met. Otherwise, the long-term secondary impacts of urbanization upon water quantity and quality would be similar to those described for the proposed action.

NO ACTION ALTERNATIVE

Taking absolutely no action would have no primary short-term adverse or beneficial impacts on water quality beyond those from existing conditions if no extensions of Auburn's sewer system were permitted. Long-term secondary impacts would be determined largely by what action the City of Auburn takes to comply with secondary treatment requirements by July 1, 1977. Secondary impacts due to urbanization without additional treatment capacity at the Auburn lagoon are difficult to assess. These impacts will depend on what methods are chosen to serve growing areas within the constraints of existing regulations.

However, as previously stated, allowing continued discharge of inadequately treated wastes from the Auburn lagoon would be contrary to the provisions of PL 92-500 and the purpose of EPA's construction grant program.

GREEN-DUWAMISH RIVER

Auburn discharges, not meeting secondary treatment numerical criteria, would continue in the near-term. Continuing these discharges should not have any significantly adverse impacts on aquatic life.

However, dissolved oxygen depressions would probably continue to occur in the river downstream. Although other factors appear to contribute more significantly to these depressions, the Auburn discharge would still contribute nutrients and oxygen-demanding wastes. Little change would be expected in the coliform concentrations in the river.

Long-term secondary impacts on water quality would depend on the technology selected to serve future needs and the actual population and industries served. The long-term impacts of four available alternatives, including the proposed action, have been discussed in the preceding sections. These alternatives all involve discharge to the Green-Duwamish River. At present, it seems unlikely that discharges to other locations (land disposal site or to the White River) will be selected.

OTHER STREAMS LAKES AND GROUNDWATERS

In the short-term, the no action alternative should have no significant impact on the existing water quality of the other streams and lakes in the Green River Sewerage Area. Long-term secondary impacts from additional growth would partially depend on whether sewerage needs are satisfied by land disposal systems (e.g., septic tank drainfields) or by secondary treatment with a discharge to surface waters. Under existing regulations much of the land in the sewerage area is generally unsuitable for drainfields. Figure 13 shows areas where soil conditions are generally suitable; however, watershed use and other types of limitations may limit actual use of these areas. Where soil conditions and other factors make the proper installation of septic tank systems more difficult, or in some cases impossible under present regulations, the land is shown as generally unsuitable. The Black Diamond plateau contains the largest amount of land generally suitable for a drainfield use. It is likely that treated wastes from the majority of the Green River sewerage area's expanding population will enter surface waters. If one of the Regional treatment alternatives were ultimately chosen, impacts in the year 2000 would be similar to those previously described.

If those areas suitable for drainfields continued to rely on land disposal rather than a Regional system, projected year 2000 waste loadings would be less than now anticipated for the Auburn or Renton treatment plant alternatives. The impacts on groundwater quality and quantity would depend on proper siting of subsurface disposal systems.

Other secondary impacts from urbanization (on peak flows, runoff, and low summer flows, for example) would be essentially the same as those for the proposed action.

SEPTIC TANK PROBLEMS

In the near-term, septic tank problems would remain essentially unchanged. For example, areas near Lake Geneva, Star Lake, Shadow Lake and Lucerne Lake would continue to rely on failing drainfields and septic tanks. Jones Lake, a highly eutrophic lake which receives drainage from Black Diamond's septic tanks, would probably continue to have unsanitary conditions.

Long-term, secondary adverse impacts may be partly avoided by existing regulations[1,21] to forestall improper siting and installation of inadequate, subsurface disposal systems, and to eliminate inadequate systems. Further development in problem areas would require compliance with regulations on subsurface or surface disposal which are more stringent now than in the past. Under current regulations, without an adequate sewerage system, much of the land in the sewerage area is unsuitable for urbanized development. Urbanization might be delayed in the short-term in some areas by the unfavorable economic aspects of providing sewage treatment for buildings on soils with severe limitations on their capacity for proper drainfield use. For example, some areas along Big Soos Creek are unacceptable for drainfield installation and it is unlikely that any denser residential development near the creek will occur until some sewage collection system is available.

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AIR QUALITY IMPACTS

The following sections describe the methodology and results of the air quality analysis of the service area.

LAND USE PROJECTION

Three possible procedures for the projection of future conditions for the Auburn area were considered:

1. extrapolating existing emissions at an assumed growth rate occurring at the identical location of present sources;
2. assuming that emission changes occur in proportion to the acreage planned or zoned for each individual use; and
3. assuming that emission changes occur in proportion to various activity indices (e.g., manufacturing employment is an indicator of industrial activity and hence emissions; trip ends is an indicator of motor vehicle activity and hence emissions).

Each of these approaches was examined and the following conclusions were reached. The "growth in place" concept is unrealistic due to the large amounts of vacant land presently zoned for higher intensity uses in the proposed service area. The second approach of using land acreages as an index of change in emissions is also unrealistic since the mere designation of land for a given purpose in no way assures that it will in fact be developed as designated by a given date. Further, according to Puget Sound Governmental Conference (PSGC), there is enough land designated for industrial use in the Green River valley to accommodate all of the industrial growth projected for the entire Puget Sound four county area to the year 2000. Since it is very unlikely that all of the region's growth is going to occur in the valley, the use of acreages as an index of emission changes would be unrealistic.

The third approach, using activity projections made by PSGC as indices of emissions changes, appears to be the most realistic one under the time constraints of the study. Baseline and projected estimates of population, retail and industrial employment, and trip generation on a sub-area basis (activity allocation zones) are used to generate area-specific emissions estimates.

Studies by the Argonne National Laboratory have confirmed the conclusion that economic indices of growth provide better estimates for emission projection purposes than either the land acreage methodology or the growth in place assumption.[1]

EMISSION INVENTORY

The 1973 King County emission inventory for the area includes all point sources located within the Green River valley area. Some of these sources, those in the Renton area, are outside of the area to be served by the interceptor. These, however, are located in the Green River valley area and may make a significant contribution to the ambient particulate concentration in the Auburn area.

The 1990 point source inventory is assumed to be the same as the 1973 inventory. Data currently available from the Puget Sound Governmental Council (PSGC) do not permit projecting the type and size of point sources that may locate in the service area. However, should any major point source locate in the area, it will be subject to new source review procedures under PSAPCA Regulation I.

Thus, the emission projection to 1990 is concerned with the impact of increased emissions due to "area sources" of particulate matter. The King County area emission inventory includes residential, commercial and small industrial space heating units, motor vehicle particulate emissions, railroad emissions, fugitive dust (due to travel on dirt roads, construction activity, and structural fires), incineration, open burning, and off-highway vehicle emissions. The 1973 inventory and the PSGC activity allocation indices were used to allocate area emissions to sub-areas within the service area. The following steps were involved:

1. select the index most appropriate for each emission source category (e.g., residential fuel combustion emissions are directly related to the population projections and distribution);

2. Calculate the emissions per activity indicator index (EAI factor). This is done by dividing the total county-wide emissions for a particular area source category by the appropriate activity index for the county (i e., tons of particulates from motor vehicles in King County divided by the motor vehicle trip ends in King County);

3. Allocate 1973 King County emission to PSGC activity allocation model sub-areas within the service area. This is done by applying the 1973 EAI factor to activity levels within each sub-area;

4. Calculate 1990 EAI factor by assuming reductions due to implementation of known control regulations by 1990 applicable to the Auburn area (open burning and residential incineration prohibited, and catalytic converters used on all automobiles); and

5. Compute 1990 district emissions by applying the 1990 EAI factor to PSGC projected index allocations.

ESTIMATING CURRENT AND FUTURE AIR QUALITY

The Air Quality Display Model (AQDM) is used to estimate the impact that growth-generated particulate emissions in the Auburn area would have on the air quality in the Kent-Auburn Valley and on Seattle and Tacoma in 1990.[2] The AQDM generates a spatial distribution of particulates on an annual basis. Required input to the model is the estimated emission inventory for the year in question, a representative annual stability wind rose, and the average annual mixing depth.

To determine the impact of emissions in the service area on the overall air quality, the AQDM is first run using the estimated 1973 emission inventory. A synthesized 1973 stability wind rose, generated from meteorological data recorded at Seattle-Tacoma airport and wind data recorded at the Puget Sound Air Pollution Control Agency (PSAPCA) station in Tukwila[3] is used in making these estimates.

The average annual mixing depth is derived from data contained in AP-101.[4] The average annual mixing depth was determined by averaging the annual morning and afternnon mixing depths at Seattle/Tacoma airport. While, intuitively, one might suspect that mixing depths in the Kent Auburn valley would be somewhat lower than this value, there is no data to support this, and assignment of a different value would be arbitrary.

The estimated air quality from use of the model, in addition to background concentrations is compared to the measured 1973 air quality levels in the Auburn area. The difference between the measured values and the combined figures of estimated concentrations and and background values is assumed to be the relative contributions of unquantified sources within and outside of the service area to the overall air quality in Auburn.

The 1990 air quality can also be visualized as consisting of three components: 1) contribution from service area emissions, 2) background, and 3) unquantified sources. The contribution from the service area emissions is determined by modeling using the 1990 emissions and the 1973 meteorological conditions which are assumed to be also representative of 1990. The background concentration in 1990 is assumed to be the same as for 1973.

Since there is no measured air quality data for 1990, the contribution from the unquantified sources must be estimated. This is done by assuming that the 1990 contribution is a percentage of the 1973 contribution. Since we do not know the exact origin of the unquantified contribution, the exact percentage cannot be determined. However, through consideration of possible origins of such contribution, attempts have been made to bracket this contribution on a best case/worst case basis. Best case utilizes a set of assumptions concerning the origin of the unquantified contribution that results in the best air quality, while the worst case employs the assumptions yielding the most severe impact. This best case/worst case analysis only establishes limits on the impact of the unquantified emissions and should not be construed as the limits on total predicted air quality for the Auburn area.

RESULTS

The results of the air quality analysis are given in some detail in Appendices B and C and will only be summarized here. Table 32 shows the 1973 base year and the 1990 projected populations and emissions in the service area by PSGC activity zone. See Figure 14.

TABLE 32. SERVICE AREA POPULATION AND EMISSION ESTIMATES.

	1973		1990	
Activity Zone	Population	Emissions (T/Y)	Population	Emissions (T/Y)
1320	1815	27.46	3720	35.11
3020	3112	39.25	5087	47.73
3040	3372	33.35	6372	40.05
3050	8577	42.04	13613	45.69
3100	10716	177.01	12071	274.58
3110	378	22.15	2851	32.52
3120	4934	108.49	8164	110.59
3130	4550	25.57	5977	27.06
3140	10127	118.18	11140	132.82
3150	3665	36.43	7675	43.90
3220	2400	67.61	9261	71.09
3300	2301	49.29	3696	44.45
3400	2264	55.46	3355	74.51
3410	2236	21.38	4250	26.28

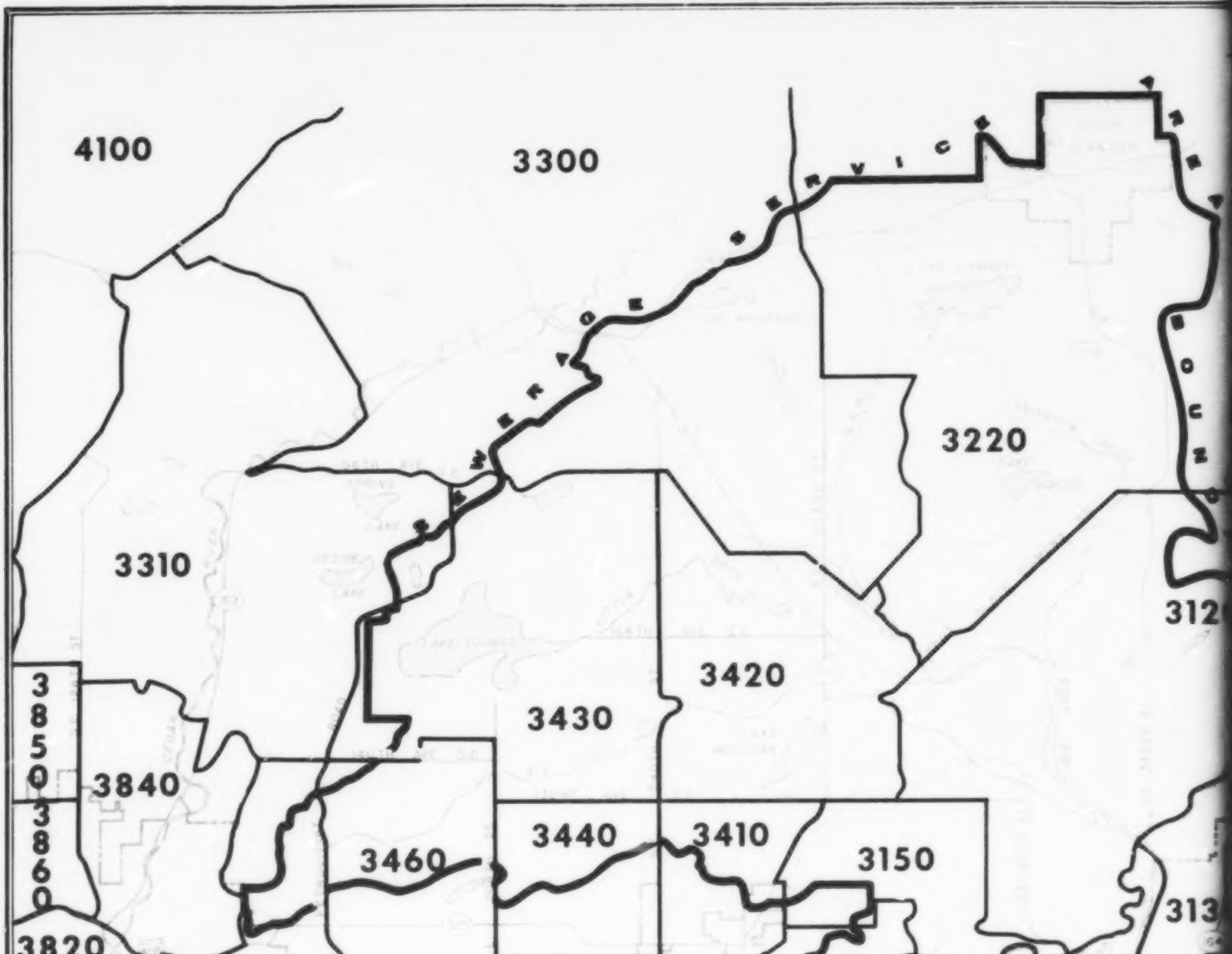
4100
3300
3310
3220
312
3850
3860
3840
3430
3420
3440
3410
3460
3150
3820
3830
313
3810
3800
3400
3140
3450
RENTON
3650
KENT
3050
3540
3640
3510
3040
3720
3630
3530
3520
3500
3030
3010
3000

FIGURE 14

ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE SEATTLE, WASHINGTON 98101

AUBURN INTERCEPTOR
(GREEN RIVER SEWERAGE AREA)

TITLE

ACTIVITY ALLOCATION MODEL

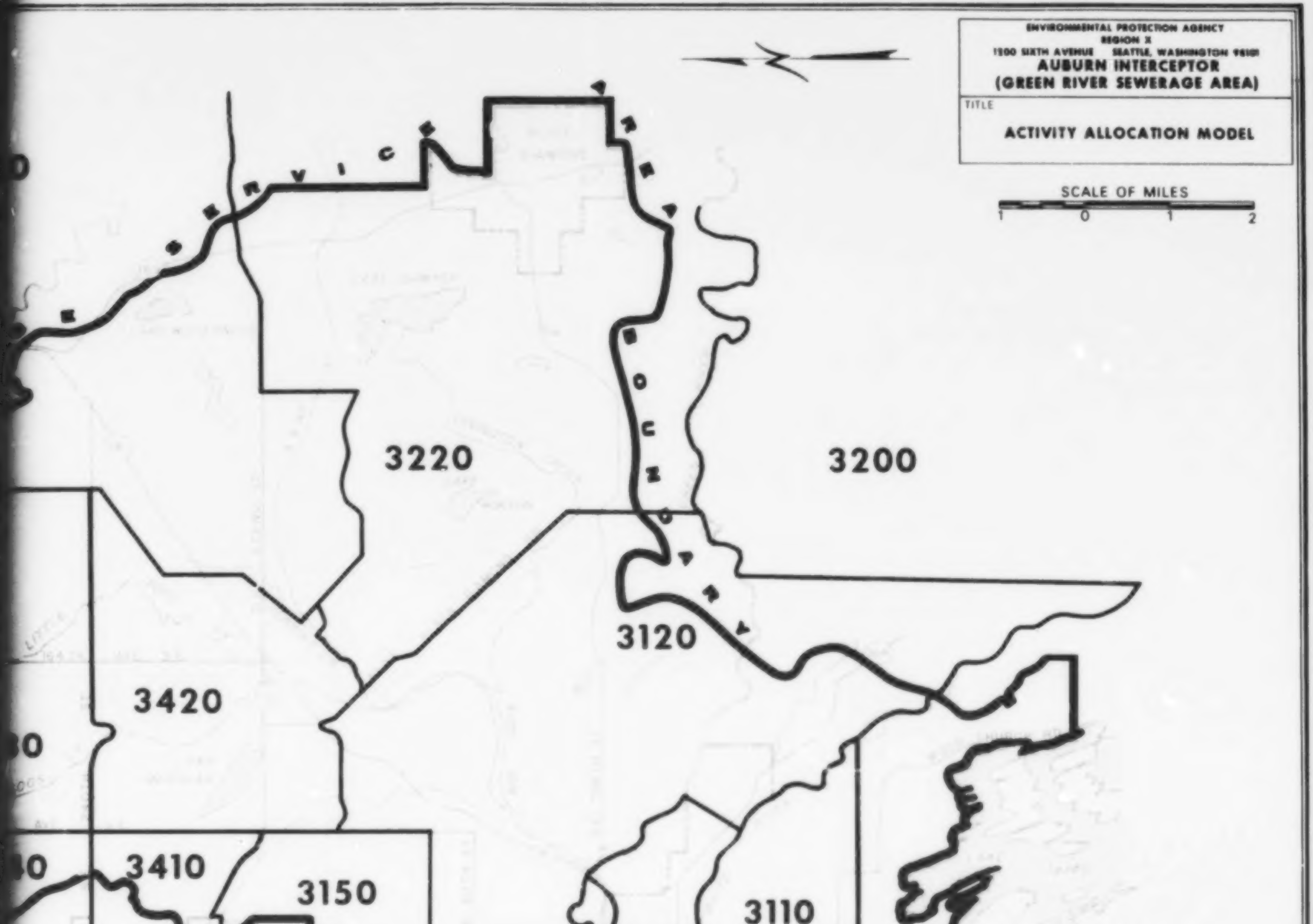
SCALE OF MILES
1 0 1 2
SERVICE AREA
BOUNDARY
3220
3200
3120
3420
3410
3150
3110
3130
3100
3140
3400
1320
1330
3050
3040
1420
3510
3020
3000
3010
3500
3030
AUBURN

TABLE 32. SERVICE AREA POPULATION AND EMISSION ESTIMATES. (cont.)

Activity Zone	1973 Population	1973 Emissions (T/Y)	1990 Population	1990 Emissions (T/Y)
3420	6479	48.89	15860	57.83
3430	3684	59.22	11039	66.82
3440	4125	20.86	7797	26.71
3450	0	29.96	0	33.89
3460	4554	41.20	9851	51.03
3830	3020	7.27	3970	7.50
Total	82309	1031.07	145749	1250.16

These data show that the overall population can be expected to increase about 77% between 1973 and 1990 while the total associated emissions will only increase by about 20% during the same time period. This difference is accounted for by the additional emission control expected by 1990 through compliance with both point and area source regulations and through application of current technology in future years. For example, motor vehicle activity was responsible for about 35% of the total particulate emissions in the service area in 1973. While a major increase in motor vehicle traffic can be expected by 1990, the partial compensating effect on automotive emissions through application of catalytic converter technology results in only a 25% increase in emissions from this source category.

TABLE 33. EXPECTED ANNUAL GEOMETRIC (μmg/m^3) MEANS FOR PARTICULATES AT AUBURN.

	1973	1990 Best Case	1990 Worst Case	1990 Most Probable
From Sources Within the Service Area (Model)	9.3	11.9	41.6	11.9
Background	28.9	28.9	28.9	28.9
From Unquantified Sources	23.2	19.3	0	23.2
Total	61.4	60.1	70.5	64.0

The results of the air quality modeling at Auburn, contained in Appendix D are summarized in Table 33. The first column indicates the results of the modeling for the base year 1973. For this year, the model predicts that emissions from within the service area (Table

32) would result in a 9.3 μg/m^3 contribution to the air quality at the Auburn monitor. Assuming a background of 28.9 μg/m^3, derived from 1973 data at the Green River Fish Hatchery, the total suspended particulate (TSP) levels at Auburn would be about 38 μg/m^3. This compares to a measured 1973 TSP level of about 61.4 μg/m^3. (The 61.4 μg/m^3 differs slightly from the actual measured geometric mean of 63 μg/m^3 because of the method used in relating the arithmetic mean to the geometric mean, see Appendix B). The difference between the identifiable contributions to the annual mean and the actual measured mean we place in a category called "unquantified source contributions."

The unquantified contribution can be associated with several factors: 1) unknown sources within the service area, i.e., those not included in Table 32; 2) contribution from sources outside of the service area, i.e., influx of airborne TSP from Seattle and Tacoma; 3) use of unrepresentative meteorological conditions in the model, i.e., the unavailability of wind and stability data for the service area mandated the use of data from outside the area; and 4) inadequacies in the model, i.e., inability to incorporate parameters. Application of the modeling to the entire Puget Sound region and calibration of the model would identify some of these contributions and may result in an improvement in predictions.

The PSAPCA has suggested that EPA shoul consider a larger area, to include Renton and Tukwila, in its air quality study thereby allowing the use of three more TSP monitoring stations which would constitute, perhaps, a minimum number for a crude model calibration. This effort would no doubt improve upon the prediction scheme. Indeed, the optimum approach would be to develop an overall workable model for the entire Puget Sound region--such a model should be developed in connection with the air quality maintenance planning process. However, the primary purpose of the Auburn Interceptor air quality study is to determine the impact of current and projected emissions within the service area on the air quality inside as well as outside of the service area. To this end it is not necessary to explain the sources of all the contributors to the air quality in the Auburn area. At the same time it recognized that the application of an uncalibrated model on an even calibrated model leaves some level of uncertainty in the relationship between service area emissions and air quality. The analysis below is an attempt to put bounds on this uncertainty factor.

The question of how to consider the unquantified contribution for air quality estimates in 1990 is handled on a best-case, worst-case basis. It is assumed that the 28.9 μg/m^3 background concentration would be the same for all cases in 1990. For the best-case analysis (Column 2 in Table 33) it is assumed that all of the unquantified contribution comes from sources outside of Auburn, primarily Seattle and Tacoma. Emissions from these sources are expected to decrease 17% between 1973 and 1990 as a result of a combination of compliance attainment (decrease) and growth of area sources (increase). Thus, a 17% reduction factor is applied to the 23.2 $\mu g/m^3$ unquantified TSP. This, coupled with an increase in TSP associated with the area's emission growth (model result), shows that the 1990 TSP levels in the Auburn area should be 60.1 $\mu g/m^3$.

For worst-case analysis, it is assumed that all of the unquantified emissions originate in the Auburn area and will increase between 1973 and 1990 at the same rate as those in Table 33. For this case we estimate that the 1990 TSP would be 70.5 $\mu g/m^3$.

It is believed that the most probable situation is between the best and worst case in that the unquantified contribution will be about the same in 1990 as in 1973. This results in an expected TSP level of 64 $\mu g/m^3$ which is essentially the same as the 1973 base year level.

In addition to the impact of the service area emissions on the air quality within the service area, it should be mentioned that these emissions will cause a slight impact on the TSP levels outside of the area. The model estimates that these emissions will contribute about 7 $\mu g/m^3$ at Renton and less than 1 $\mu g/m^3$ in Seattle and Tacoma.

The impact of these projected annual TSP levels on the 24-hour standards can be determined by assuming a log normal distribution and using Larsen's transformation to estimate the second highest daily average.[5] Using the standard geometric deviation of 1.572, derived from the actual data collected at Auburn from 1971 through 1974, and the modeling results described above, the second highest yearly values were estimated to be 225, 205, and 190 $\mu g/m^3$ for the worst case, the most probable case, and the best case, respectively. These numbers compare with a primary standard of 260 $\mu g/m^3$ and a secondary standard of 150 $\mu g/m^3$.

CONCLUSIONS

The 1973 levels of TSP in the Auburn area indicate that the secondary standard attainment is currently marginal. During 1973, there were no measured concentrations in excess of the secondary standard of 150 $\mu g/m^3$ (61 observations); however, analyses of the standard geometric deviation indicates that about seven concentrations in excess of 150 $\mu g/m^3$ would have been expected. With the addition of an expected 20% increase in emissions in the service area in the next 15 years, it seems reasonable that this secondary standard will be exceeded between 7 and 16 days per year. The primary standard of 260 $\mu g/m^3$, annual geometric mean, is not expected to be violated.

REFERENCES

1 Argonne National Laboratory Center for Environmental Studies. Kennedy et al. "Air Pollution - Land Use Project -- Phase I Final Report," November, 1971.

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3 Puget Sound Air Pollution Control Agency, Letter, February 24, 1975, from A. L. Kellogg (PSAPCA) to Dean Wilson (EPA).

4 Holzworth, George. "Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States," U. S. EPA Report No. AP-101, January, 1972.

5 Larson, Ralph. "A Mathematical Model for Relating Air Quality Measurements to Air Quality Standards," EPA Report AP-89, 1971.

6 Washington State Department of Highways, Planning Division, "Urban Areas In Washington", 1972.

NATURAL VEGETATION, WILDLIFE, AND FISHERIES IMPACTS

PRIMARY IMPACTS OF THE PROPOSED ACTION

The primary impacts on terrestrial communities during construction of the Auburn Interceptor will be borne by the wetlands and open fields which the proposed corridor passes through or skirts. The impacts include the removal of vegetation, disturbance of soils, and loss of habitat. Damage can be minimized, but not eliminated, by restricting the size of the construction easement in critical areas, by scheduling construction during low-rainfall periods, and by starting restoration as soon as possible following construction.

GENERAL IMPACTS ON VEGETATION AND WILDLIFE

Construction will necessitate removing vegetation, and dewatering and digging up of soils. Exposed soil surfaces will be subject to erosion. Excavated or eroded material can crush and destroy otherwise undisturbed vegetation. Though plants in the path of interceptor construction will be removed, grassy vegetation should rapidly reestablish itself within two years after construction. Shrubs would take longer to reestablish themselves.

Some wildlife resting, nesting, and cover areas, as well as food sources, will be eliminated during construction. Displaced animals cannot be expected to move aside and reestablish elsewhere, unless they do so at the expense of other animals with which they successfully engage in intra- or interspecific competition. Noise will increase significantly over ambient levels during construction. Noise, traffic, and other construction-associated disturbances may impact wildlife adjacent to the construction corridor to some undetermined extent.[1] When vegetation is reestablished, the construction corridor will be available for colonization by animals.

SPECIFIC IMPACTS ON WETLANDS

The Auburn Interceptor passes through and skirts extensive wetlands. It is EPA policy that wetlands are unique, valuable and irreparable water resources which require protection. Both the Puget Sound Governmental Conference and the King County Environmental Development Commission have issued policy statements which discuss protection of wetlands.[2,3]

The construction corridor passes through a 30-acre area of untyped wetland just north of South 228th Street in Kent. At this location, a combination of fence lines, drainage ditches, and wet soil conditions has prevented cultivation. As a result, plant succession has continued undisturbed and a small grove of willows, Indian-plum, Western crab-apple, and Oregon ash has become established. Rushes, sedges, cattails and bullrushes are also found there. Many bird species have been observed in this area, and it is appropriate habitat for many small mammals.[1]

Immediately south of South 277th Street, the corridor passes through the easterly limits of a 20-acre Type VII wetland, the only wooded swamp in the valley section of the study area. This natural perennial wetland has developed from an old cut-off river meander which extends through the Puget Power right-of-way to a trestle at the Chicago, Milwaukee, St. Paul, and Pacific/Union Pacific Railroad tracks. Field observers have noted a great variety and number of birds in this area of thick brush, shrubs, trees, and marshy vegetation.[1] The interceptor corridor passes through 88 acres of untyped wetlands south of South 228th Street.

Protection of the 20-acre Type VII wetland is important for several reasons. First, it is the only wooded swamp in the valley portion of the project area. Such permanent wetlands were never extensive in the Green River valley and most have already been lost to development. Second, wooded vegetation requires a long time (approximately 10 to 15 years) to reestablish itself. Third, this area is appropriate habitat for some rare and endangered animals. The great blue heron, green heron, and Bewick's wren have been observed in this Type VII wetland.[1] This wooded swamp is also appropriate habitat for most of the rare, threatened, or endangered hawks; owls; and songbirds presented in Table 11 .[4]

Construction will impact rare or endangered animals to the extent that it will temporarily eliminate habitat. The scarcity of these animals may decrease the possibility of their re-colonizing appropriate habitat after it is restored. Several endangered birds - the whistling swam and Aleutian Canada goose - are migratory species which use the wetlands seasonally. Rare and endangered birds utilizing wooded swamps are described above.

Limiting construction to the summer months would mitigate some of the short-term adverse impacts. Waterfowl usage of the valley is lowest during the summer. Less dewatering would be necessary and fewer problems due to erosion would occur. However, temporary loss of vegetation and habitat would still occur in the construction corridor.

SECONDARY IMPACTS OF THE PROPOSED ACTION

The major secondary impacts resulting from growth and development include loss of wetlands, vegetation, and wildlife habitat. Also construction of future connectors to the interceptor can directly impact biological communities. Local comprehensive land use plans were compared to maps of wetlands and plant communities to gauge these impacts.

Loss of wetlands, vegetation, and wildlife habitat are interrelated phenomena. Natural wetlands moderate stream flow. They are responsible for the slow release of water into stream systems during periods of low precipitation and the absorption of large quantities of water at times of rainfall. The moist soils and dense vegetation of wetlands also serve to filter water. Drainage of marshes and river control have already decreased the wetlands within the RIBCO study area which include the Auburn Interceptor service area.[5]

To develop many sites in the Green River valley floodproofing is necessary and is required by ordinances of local governments. Floodproofing is usually accomplished by landfill to a prescribed minimum level.[6,7] This filling buries and eliminates natural wetlands. It alters natural drainage patterns. In addition, during the filling operation and until revegetation occurs, erosion can lead to problems with turbidity and suspended solids. With development, the increase of impervious surfaces (e.g., streets, roofs, sewers) with development increases the rate of peak discharges. Pollutants, which accumulate on these surfaces between rains, arrive at streams in high concentrations during major storms.

In areas with intact natural vegetative cover, the evapo-transpiration activity of plants accounts for up to 70% of the recycling of water into the atmosphere.[5] Streamside plant cover moderates water temperature. Clearing this vegetation can increase temperatures beyond the tolerance limits of anadromous fish, and also cause silting and erosion.

The well-groomed vegetation of most landscaped urban areas has less biomass and surface area than natural vegetative cover. Therefore, it is less active in returning water to the atmosphere. This leads to increased runoff. Pesticides and fertilizer usage characteristic of residential areas can lower the quality of runoff.[5]

One of the conclusions of the RIBCO study of urban runoff and basin drainage is that "the natural vegetative cover and wetlands within the (RIBCO) study area act as effective moderators of storm runoff when unaffected by urbanization. The loss of these elements and replacement by impervious surfaces represents a serious threat to stream systems."[5] The study suggests that one approach to urban runoff problems is land use restrictions which would lead to the preservation of wetlands.

Loss of wetlands and vegetation (in wetlands and in other plant communities) directly eliminates wildlife habitat. Much of the wetlands in the study area, particularly the Type I wetlands in the Green River valley, are important resting and feeding areas for migratory and wintering waterfowl. Natural habitats in the study area are utilized by a number of rare, threatened or endangered species.

A comparison of the comprehensive land use plans with the wetlands map shows that approximately 2100 acres of wetlands in the Green River valley would be lost to industrial and residential development. The comprehensive land use plans show approximately 39% of the valley is planned for industrial and commercial use; 31% of this land lies within wetland areas. An additional 1230 acres of wetlands in the rest of the study area are slated for residential and commercial development.

An examination of the local comprehensive land use plans shows that approximately 13,000 acres of wooded land is slated for industrial and residential uses. This will eliminate much wildlife habitat, including wetlands, riparian woods, and wooded swamp land. Streams such as Mill and Big Soos Creeks are in areas planned for development. If development adjacent to these streams results in clearing streamside vegetation, some of the biological and water quality problems discussed above can be expected.

IMPACTS OF THE ALTERNATIVES

The no-action alternative will have no beneficial or adverse impacts on terrestrial biota.

Any sewerage treatment alternatives designed to service the same population as the Auburn Interceptor would have impacts similar to those described for the interceptor. It is impossible to comment specifically on the impacts of, for example, building a secondary treatment plant at Auburn since the exact location and acreage necessary for such a plant is not known.

Construction of staged interceptors will subject an additional construction corridor to primary impacts similar to those discussed for the Auburn Interceptor. Metro has described two alternate routes for a second-stage interceptor. Both of these routes pass through or skirt several wetlands -- a 21 acre Type III wetland and several untyped wetlands totalling 87 acres.

IMPACTS OF THE PROPOSED ACTION ON FISHERIES

PRIMARY IMPACTS

There will be no significant primary impacts on the fisheries of the Green - Duwamish River system as a result of the proposed project.

SECONDARY IMPACTS

The secondary impacts of the proposed project as they relate to fisheries would be a product of residential, commercial and industrial development permitted by local land use plans. Potential impacts of this development on aquatic life are identified in the following tables. These impacts will have a negative effect on the Green River valley anadromous fishery but to what extent is unknown. Additional discussion of water quality effects on the fishery is included on the section of Water Quality Impacts.

TABLE 34. IMPACTS ON FISHERIES.

Parameters	Quantity	Effects on Salmonids	Cause	Comment
suspended solids	increase	asphyxia of developing larval salmonids by plugging interstices of redds during winter season. *	earth moving activities; negligent waste	Constituents: silt, sand, clay, mulch, leaves, paper, etc.
oil & grease	increase	destruction of the osmotic exchange characteristics of the egg membrane kills or deforms the developing embryo. *	increased density of trucks, automobiles, asphaltic parking areas, etc.	Probable increase in negligent disposal of waste automotive oil into storm drain systems.
water temperature	increase	causes upstream migration blockage of adults resulting in late arrival on spawning grounds for Fall and possibly Summer run salmonids. Frequently results in non-viable spawn for native salmonids. * would also stress and possibly cause mortality to developing fry of coho, chinook, and resident species salmonids.	decreased flow, shade, and groundwater recharge	causes decrease in dissolved oxygen concentration and facilitates algal blooms

TABLE 34. Continued.

Parameters	Quantity	Effects on Salmonids	Cause	Comment
dissolved oxygen	decrease (during low flow season)	same as "water temperature" above *	elevated water temperature and biochemical oxygen demand	the biochemically decomposable organics in the Green River should be reduced by the project. These however, in the Duwamish River due to the project.
nutrients	decrease	decreases tendency in the Green River for algal blooms and hence dissolved oxygen depression, but also reduces aquatic insect density, thus reducing available food supply.	collection and removal of sanitary wastes; reduction of agricultural (livestock) waste contribution by conversion of land use.	may contribute to increased algal bloom and associated dissolved oxygen problems in the Duwamish River.
groundwater contribution	decrease	will reduce cooling effect on surface waters during low flow season thus contributing to upstream migrant dissolved oxygen--temperature blockage	conversion of agricultural and undeveloped land to "developed" surfaced land.	

TABLE 34. Continued.

Parameters	Quantity	Effects on Salmonids	Cause	Comment
peak flow	increase (in frequency and volume)	reduce natural propagation by destruction of redds (and the incubating salmonid eggs) during winter high rainfall flash flooding. *	dense grid storm drain system; surfacing of previously agricultural or undeveloped lands.	
hazardous or toxic material spills	increased probability	deletorious, but to what extent is unknown. *	accidental or intentional waste disposal in storm drain systems.	

TABLE 34. Continued.

Parameter	Quantity	Effect on Salmonids	Cause	Comment
channelization and streambank maintenance	increase	contributes to high flow velocities destroying redds and the incubating eggs either by physically removing the redds or plugging the interstices of the redds with scoured bottom materials; also decreases stream shading. *	public requests for flood control measures	Soil Conservation Service existing proposal
non-flotable debris	increase	unknown--probably insignificant impact on salmonids	public apathy and disregard for beauty of natural resources	primarily aesthetic impact
flow augmentation	increase	highly beneficial; reduces probability of temperature and dissolved oxygen migration blockage; alleviates the temperature stress created by reduction of groundwater cooling (by dilution) of surface waters; reduces the probability of algal blooms through nutrient dilution and water cooling.	public request and support	Fisheries Agencies recommended use of the water resource

* Also has a profound deleterious impact on preferred salmonid food organism density, limiting the propagation success of primarily the native salmonid species.

REFERENCES

1 Auburn Interceptor Environmental Impact Statement. Metro, January 1974.

2 Puget Sound Governmental Conference Open Space Element of the Comprehensive Plan: Policies Plan adopted November 17, 1965 and incorporated into Interim Regional Development Plan, August 12, 1971.

3 King County Environmental Development Commission Report on Open Space - Section II Wetlands Element Approved. December 21, 1972.

4 Personal communication, Leonard Steiner, Seattle Audubon Society.

5 Draft copy, final report, Urban Runoff and Basin Drainage Study Green and Cedar River Basins of Washington, U. S. Army Corps of Engineers. 1974 (for RIBCO).

6 State Flood Control District Law RCN 86.16.

7 U.S.D.A, The East Side and West Side Green River Watershed Projects, King County, Washington, Soil Conservation Service, Preliminary draft EIS (in preparation).

This section describes those adverse impacts resulting from the proposed action and discusses measures which may be taken to minimize or eliminate them. Also discussed are potential adverse secondary impacts and measures which might be employed to avoid them.

ADVERSE PRIMARY IMPACTS

Adverse primary impacts include those of short term, occurring during construction, and long term, related to construction and operation of the interceptor and related facilities.

SHORT TERM IMPACTS DURING CONSTRUCTION

Construction activity will result in some noise, dust and erosion, with temporary lowering of air and water quality. Impacts of this nature can be minimized by careful design and construction practices and adequate on-site inspection to assure contractor compliance with applicable specification and permit requirements, including the crossing of the Green River during that time of year which would be least harmful to the fishery.

Unavoidable adverse impacts on terrestrial communities within the construction corridor include the removal of vegetation, disturbance of soils, and temporary loss of habitat (both open fields and wetlands). Some of this habitat is known to be, or is, appropriate habitat for some of the rare, threatened, or endangered species shown in Table 11. The only permanent wetland along the construction corridor is a Type VII area just south of 277th project area and its wooded vegetation could require approximately 10 to 15 years to reestablish naturally to its present condition.

Development of a revegetation plan would lessen impacts along the construction corridor. The plan would insure the establishment of vegetation maximally suited to reducing erosional impacts, enhancing wildlife habitat and adding to the aesthetics of the Green River valley. Limiting construction to the summer months would mitigate some of the short-term adverse impacts. Waterfowl usage of the valley is lowest during the summer. Less dewatering would be necessary and fewer problems due to erosion would occur. Narrowing the portion of the construction easement which is actually utilized in wetlands would also mitigate the impact on these areas. Other mitigation could involve relocating the proposed interceptor to avoid the wetland near South 277th Street. It should be noted, however, that a petroleum

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pipeline was constructed through this area several years ago, with no apparent residual effects.

LONG TERM CONSTRUCTION IMPACTS

One occupied dwelling unit lies in the path of the proposed project and has been removed. An acceptable relocation plan has been prepared by Metro which provides for reasonable assistance to the tenant in being reestablished elsewhere.

OPERATIONAL IMPACTS

Although construction of the proposed interceptor would result in the elimination of inadequately treated wastewater discharges to the Green River at Auburn, there would be an incremental increase in the discharge from the Renton treatment plant of wastewater meeting the limits for secondary treatment. By the year 2000, a decrease in water quality in the Duwamish estuary could be expected, due in part to the projected increase in effluent discharged from the Renton plant. Potential increases in ammonia toxicities and low dissolved oxygen concentrations could be mitigated by altering treatment plant operations to include chemical or nitrification treatment units. Other mitigative measures could include low-flow augmentation by modifying Howard Hanson Dam, disposal of effluent to the land or extension of the Renton outfall to Puget Sound. Corps of Engineers participation must be sought for low-flow augmentation to be instituted. (See pages 112A and E-11).

Construction of the interceptor also would result in an increase in the amount of waste sludge pumped from Renton to West Point for digestion. There would be an attendant increase in the number of truck loads of dewatered sludge hauled from the West Point plant, a matter of concern to residents of the Magnolia Bluff area.

As noted previously, Metro is studying methods for ultimate disposal. Subject to the results of this study, mitigation of truck traffic impacts includes scheduling of trips so as to cause the least annoyance. Other mitigation could include the provision of sludge digestion facilities at other locations, including the Renton treatment plant, or removing the sludge from West Point by barge.

ADVERSE SECONDARY IMPACTS

Adverse secondary impacts essentially are those associated with growth and development permitted by local land use plans. These impacts are discussed in the context that a lack of sewerage facilities can be one of many constraints to growth and the construction of the proposed interceptor will reduce that particular constraint. Also included is a description of mitigative measures which may be taken. However, as noted throughout this statement, the key factor in avoiding severe environmental degradation as a result of land development is local governmental planning and control.

WATER QUALITY IMPACTS

As urbanization of the Green River Valley Sewerage Area continues, surface water quality can be expected to decrease, stream flows probably will decrease during dry weather and increase during wet weather, and the potential for flooding will increase. Also, urbanization will reduce the amount of pervious surface available for recharge of groundwaters. Implementation of mitigative measures would depend on actions by local authorities.

High surface water temperatures could be reduced by low-flow augmentation (if this proves feasible after study by the COE) and by planting shade trees along banks. Toxic material concentrations could be reduced by restricting the sale and use of pesticides and other toxic materials.

The impacts of urban runoff in tributaries to the Green River could be reduced by providing ponds to retain surface drainage during periods of high runoff. Control of the rate of discharge to surface waters would reduce the potential for flooding and reduce the discharge of silt and debris. Additionally, if located in pervious areas, recharge of groundwaters could be enhanced. Other measures to minimize the effects of urban runoff could include frequent cleaning of streets and catch basins to reduce the amount of debris reaching surface waters, or regulations to restrict increased runoff for new developments. Other methods have been evaluated in the RIBCO study and recommendations for each tributary basin are under public review at this time.

Flow augmentation to a Washington State Department of Fisheries minimum flow level established by the Department of Ecology through their Base Flow Program appears necessary to prevent upstream migration blockage. The hatchery program must be maintained at least at its current level. Catch basins to intercept high Fall-Winter storm drainage flows upstream of the major native salmonid spawning grounds should be encouraged.

higher by 1990. The assessment of air quality for 1990 incorporated the anticipated effects of all existing regulations containing compliance dates after 1973. Other measures which may further reduce emissions in the service area could be implemented prior to 1990. These potential measures were not included in the assessment since the basis for their incorporation is not founded on existing regulatory authority or emission control technology. These measures could include the following:

1. Elimination of slash burning.
2. Conversion from fossil fuel to electric heat.
3. Improved automotive emission control technology.
4. Paving of dirt roads.
5. Reduced usage of the automobile as a result of energy constraints of improvements in mass transit.
6. Improved combustion source emission control technology.

Increases in particulate emissions within the service area could also be limited by imposing constraints on the expansion of existing sources and on the addition of new sources. In either case, land use and transportation controls might be used. The air quality maintenance planning process expected in the service area will examine the need for this type of control. Examples of such controls are emission allocation systems, emission density zoning, and emission fees. The degree and type of emission growth control to be instituted in the service area as required by EPA's AQMP requirement will not be known for several years.

TERRESTRIAL IMPACTS

The major terrestrial impacts of growth and development in the Green River Sewerage Area would be the potential loss of wetlands, vegetation and wildlife habitat, including some potential habitat for rare, threatened or endangered species. Given the present local comprehensive land use plans, these impacts are unavoidable. However, some measure of preservation of these areas could be achieved through the imposition of constraints on development in the wetlands. In addition to the imposition of such controls by the local agency of government, other preservation measures could include the acquisition of wetlands and other sensitive areas by conservation agencies, groups or societies.

For specific projects, zoning changes and building permits would be subject to the same scrutiny as this proposed interceptor project through the mechanism of the State Environmental Policy Act (SEPA) and, if a Federal agency is involved, the National Environmental Policy Act (NEPA). For areas in close proximity to larger streams and lakes, development would have to be in compliance with requirements of the State Shoreline Management Act.

LAND USE IMPACTS

Continuation of present trends toward increased urbanization of the Green River Sewerage Area will result in the commitment of additional areas of vacant or relatively undeveloped land to industrial, commercial and residential uses. The availability of sewer service will increase the capacity of the area to accept development and could permit it sooner than otherwise might occur. However, that portion of the entire area which feasibly could be served initially would be relatively small. Service to the remainder of the area would require the construction of additional extensions to the system. An environmental evaluation of the effects of these extensions would have to be made before installation could be allowed.

As noted previously, decisions as to whether development occurs, and the areas in which it takes place, are the province of local government. The assurance that sewer service and other utilities and services would be available could be of assistance to local government in achieving more orderly development than might otherwise take place.

Mitigative measures which might be utilized in managing the impacts of growth and development on land use eseentially are the same as those cited for terrestrial impacts: local land use controls, SEPA, and NEPA. Additionally, tax incentives by local government could make continued agricultural use more attractive to property owners.

SOCIOECONOMIC IMPACTS

Increased urbanization will result in increased costs for the expansion and improvement of community facilities and services necessary to accommodate growth and development. Local comprehensive plans could be amended from time to time to minimize these costs. In developing areas, the availability of sewer service could eliminate the duplication of cost involved if septic tanks and drainfields were installed initially only to be followed a few years later by a sewer system.

The proposed action will involve the commitment of renewable and nonrenewable resources. Some of these resources will be affected in and along the proposed route. During construction, some existing soil and plant communities inside the pipeline corridor will be destroyed or disturbed. The corridor itself covers approximately forty to fifty acres. This action is not, however, entirely irreversible because after construction is completed, the corridor could conceivably be replanted with native vegetation or even utilized for agricultural purposes.

The interceptor will probably commit future generations to specific actions and resource uses in managing water quality in the Green River Sewerage Area. The establishment of regional wastewater collection and treatment systems, of which the proposed action is a part, could result in a commitment of resources that is essentially irreversible. The interceptor has been designed in such a way to allow future interceptor and trunk sewers in the Green River Sewerage Area to hook directly into the proposed project. Alternative wastewater collection and treatment systems serving the sewerage area can be precluded by the presence of the Auburn Interceptor. Though technology may develop new wastewater collection and treatment systems, new facilities within the sewerage area will probably continue to be built around the proposed interceptor facility and the Renton Sewage Treatment Plant.

The proposed project could possibly be utilized as an element of some alternative wastewater management schemes for the Green River Sewerage Area or Metropolitan Seattle area. For example, if it would become beneficial in the future to "plug-in" advanced wastewater treatment plants for developing process water for flushing the Green River and/or Duwamish Estuary, the proposed project could be utilized for "plugging in and out" and transporting the residual solids. Such alternative treatment configurations, considerably different than Metro's Comprehensive Plan, are presently being evaluated as part of the RIBCO study.

The long-term effects on land use resulting from the implementation of the proposed action have been described in previous sections. It should be noted that most present trends are likely to continue regardless of the proposed action.

Southwestern King County can be expected to grow in response to the natural expansion of the Seattle and Tacoma metropolitan areas. This growth is probably irreversible. Providing adequate wastewater treatment and collection systems to the Green River Sewerage Area could

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accelerate the urbanization process within the sewerage area and direct growth to areas provided with sewerage facilities. The present character of much of the sewerage area is likely to be altered as a consequence of its urban development. As these new developments begin to locate in the Green River Sewerage Area, increased amounts of land will be irretrievably lost.

IMPACTS OF THE PROPOSED ACTION

The Auburn Interceptor, an integral part of Metro's regional sewerage plan, would have several benefits. Intercepting Auburn's wastes will eliminate the discharge of inadequately treated wastewater to the Green River, thereby improving the water quality and ceasing the current violation of EPA's secondary waste treatment standards. Furthermore, eutrophication of some lakes in the sewerage area, caused by septic inflow, may be slowed by the eventual diversion of septic waste into a sewerage system. In addition, substitution of sewer service for septic tanks can significantly decrease the potential of septic tank failures or faulty drainage from polluting groundwater, lakes, and streams.

The proposed action will provide jobs on the project itself and in the community. For every $40,000 spent in EPA's construction grant program, one man-year of work is created. In the community, more jobs may materialize if growth and development occurs after DOE lifts its ban on connections to and extensions of the sewer system.

The proposed action, along with many other factors including land use plans, other projects in the valley, and the economic climate, will allow growth. (The extent to which any sewerage system will allow growth is the extent to which it will accommodate it.) How well a sewerage system accommodates growth, planned and made feasible by other efforts, depends on how much excess capacity is built into the system. In this respect, the Auburn Interceptor is no different from any of the other alternatives designed for similar capacities.

The proposed action, which includes a certain excess capacity, is sufficiently flexible to permit each municipality in the service area to exercise its own land use options. (With adequate availability of sewage treatment that meets State and Federal standards, outside involvement in local development and land use may be lessened.) The evaluation of the local comprehensive land use plans and the discussion of potential social, economic and environmental impacts provided in the text of this EIS should prompt the public and local officials to re-examine their community goals and to prepare for anticipated growth.

IMPACTS OF GROWTH AND DEVELOPMENT

With sound land use planning and zoning consistent with this planning, the adverse secondary effect of growth and development may be

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softened, or in some cases, may not occur at all. Growth must be planned for and managed within a framework of sound growth policies and laws, including those which safeguard the environment. If environmentally-sound decisions are made during future growth, long-term decreases of productivity in man-made and natural systems may be mitigated.

Projections indicate that growth will likely continue in the Green River valley. Agricultural land is likely to be lost because industrialization, land speculation, and other development pressures will encourage high property taxes which the small farmer may not be able to pay. Furthermore, farm land that is worth more as an industrial park will tempt owners to sell.

However, inhibitions to farming in the valley do not just come from developmental pressures and property taxes. Testimony provided at the public hearing on the interceptor project (December 13, 1973) by a farmer whose family has been farming the valley since 1920 describes the problems of farming land which is subject to ponding and flooding. As discussed in PSGC's Regional Agriculture Report, (p.84), farmers in the valley are also subject to such pressures as (1) LID assessments inequitable to the benefits received from improvements, (2) minimum wage requirements inconsistent with labor productivity, (3) laws and regulations unnecessarily restrictive to normal agricultural operations and (4) constriction of market outlets for production through loss of processing operations and increased importation of extra-regional produce.

Already, a transition is beginning in the valley. Between 1965 and 1973, approximately 30% of the agricultural land was taken out of agricultural production. Much of this land remains open space, but with a potential for development. Roughly, 11,500 out of 20,000 acres within the corporate limits of Kent and Auburn are zoned commercial or industrial. These and other valley cities control about 73% of the land in the Green River valley.

As agricultural land use wanes and industrial, commercial, and other urban-type uses take its place, the water runoff from the land may degrade water quality. For example, increased construction and road building can result in increased sediment loads and may introduce such pollutants as petroleum products, pesticides, and miscellaneous organic chemicals. Urban runoff contains all of these plus fertilizers, traces of heavy metals, trash and debris.

Agriculture also has its own pollutants (nutrients, pesticides, bacteria), however, its distribution may be limited. Taking the Green River valley as it is today, we find some agricultural pollution from runoff but only a minimal amount of the total potential since approximately only 10% of the valley is now devoted to agriculture. This leads to a conclusion that the water quality in the valley is now probably at optimum level since most of the land in the valley now is unfarmed, open space. Any change in the future, including increased agriculture, which would result in increased land use, could result in runoff problems and a degradation of water quality.

Runoff from urbanized or developed areas, however, would tend to be more significant. For example, soil which is paved over loses such important functions as cooling and filtering runoff, and retaining moisture for recharging streams during dry periods. Furthermore, the pavement itself tends to collect a variety of toxic materials which after a dry spell can wash quickly into the nearest stream after the first rainfall. This shock loading can be extremely damaging to aquatic life.

Therefore, development and urban runoff could affect streams in the service area by increasing sediment and toxic materials. Some streams in the area, like Big Soos Creek, are important for fisheries, and could be adversely impacted by urban runoff. However, the effects of urban runoff could be mitigated by impounding runoff and also by street cleaning.

Runoff is not the only problem. According to the RIBCO report, acute chlorine toxicity to aquatic life in the Duwamish River is expected in the future. Chronic clorine toxicity may now be a problem. As the Duwamish is part of the route for all anadromous fish in the Green River valley, fisheries in the area could be greatly affected. The proposed action will augment the flow from the Renton Treatment Plant and thus make its contribution to the chlorine toxicity problem. In addition, as the effluent increases from the Renton plant, the decrease of dissolved oxygen could become excessive enough to effectively form a barrier against all migrating fish species. Any form of sewage treatmentwhich chlorinates its effluent, including the Auburn lagoon, has the potential to cause chlorine toxicity problems in the river. Dechlorination techniques now exist to mitigate this toxicity. Obviously, dissolved oxygen and other water quality parameters, can be protected or upgraded by increasing the level of waste treatment at the Renton S.T.P.

Any sewer system with built-in excess capacity which eventually will accommodate development in the valley will help make the need for development-oriented improvements, such as additional transportation and utility systems, and culverting and channelizing streams, more feasible.

This section contains letters of comment from individuals and groups to the draft EIS on the Auburn Interceptor. These letters have been printed as received by EPA, Region X. Wherever a response is required of EPA to a letter, a response page follows that letter.

On the following page is a table listing the comment letters received, the page in this chapter on which they can be found, and a general category listing of their contents. Comment categories are shown in an attempt to indicate those aspects of the proposed action about which the commentors were most interested and concerned. This may serve to direct the interested reader to those sections of the document which he may wish to restudy.

Twenty-three letters of comment were received--not a particularly heavy response to a project of this magnitude and apparent controversy. Over half of these were received after the close of the 45-day comment period. Interestingly, only six letters from individuals were received. None of these resides within the project service area. The remaining were from units of government, governmental agencies, and environmental groups.

None of the commentors was able to suggest an alternative to the proposed action which was feasible and more cost effective. Very few comments were directed toward further study of other alternatives, and very few solutions were offered for the complex questions raised by the draft EIS.

Many of the letters, however, were helpful to us in creating a better document for the final. EPA, Region X, wishes to express its appreciation to all commenting agencies, groups, and individuals for the time and effort spent in reviewing the draft EIS.

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TABLE 35

COMMENTS RECEIVED

DATE REC'D	FROM	PAGE NO.	GENERAL TONE	COSTS	WETLANDS	FISHERIES	WATER QUALITY	MITIGATION	POP-PROJECT, GROWTH	EXCESS CAPACITY	HISTORIC PRESERVATION	LAND USE, PLANNING	AGRICULTURE	CONSTRUCTION IMPACT	ALTERNATIVES	FLOODPLAIN DEVELOPMENT	FEDERAL POLICY	SLUDGE DISPOSAL	AIR QUALITY	OTHER
4/16/75	Washington Advisory Council on Historic Preservation	258	Supportive								X									
4/23/75	King Co. Department of Public Works	257	Supportive	X			X					X								
4/25/75	Washington State Parks and Recreation Commission	255	No Comment																	
5/7/75	Tacoma-Pierce County Health Department	254	Supportive																	
5/16/75	Washington Commissioner of Public Lands	253	No Comment																	
5/27/75	U.S. Department of Transportation	251	Critical											X						
5/27/75	Puget Sound Air Pollution Control Agency	247	Critical																X	
5/30/75	Washington Department of Fisheries	244	Supportive			X	X	X												
6/2/75	Robert D. Aye	234	Critical	X	X	X	X	X	X	X					X					
6/2/75	U.S. Advisory Council on Historic Preservation	230	Critical								X									
6/2/75	Preserve Land for Agriculture Now	226	Critical										X							

END OF COMMENT PERIOD

DATE REC'D	FROM	PAGE NO.	GENERAL TONE	COSTS	WETLANDS	FISHERIES	WATER QUALITY	MITIGATION	POP PROJECT, GROWTH	EXCESS CAPACITY	HISTORIC PRESERVATION	LAND USE, PLANNING	AGRICULTURE	CONSTRUCTION IMPACT	ALTERNATIVES	FLOODPLAIN DEVELOPMENT	FEDERAL POLICY	SLUDGE DISPOSAL	AIR QUALITY	OTHER
6/3/75	Christine Foulks	223	Critical									X								X
6/3/75	Washington State Highway Commission	220	Critical											X						X
6/3/75	Washington Environmental Council	202	Critical	X	X		X	X	X			X	X		X		X	X	X	X
6/3/75	Donald Miller	196	Critical						X			X							X	X
6/3/75	Peter Thorn	192	Critical			X												X		
6/4/75	Washington Department Ecology	189	Supportive				X		X											
6/4/75	U.S.D.A. Soil Conservation Service	187	Supportive		X									X						
6/4/75	U.S. Department of the Army	184	Critical				X	X									X			
6/4/75	Philip Wong	180	Critical			X	X		X			X								
6/4/75	Washington Department of Game	178	Supportive & Critical		X	X		X				X								
6/9/75	Puget Sound Governmental Conference	174	Supportive							X		X				X				X
6/9/75	O.M. Hartnett	171	Critical	X	X				X				X							

829 37th Avenue
Seattle, Wa. 98122
June 1, 1975

Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Re: Auburn Interceptor Draft Environmental Impact Statement

Dear Mr. Thiel,

After reading the latest draft of the Environmental Impact Statement concerning the Auburn Interceptor, I wish to ask several questions that remain in my mind.

The DEIS states repeatedly that the need for the interceptor is based on population and employment forecasts made in 1971 by the Puget Sound Governmental Conference. These projections are quoted without reservation throughout most of the statement, but on page 105 they are said to be perhaps "overly ambitious," "not reflecting national demographic trends," and in obvious discrepancy when compared to the Office of Business and Economic Research Services' 1973 forecasts. In an EIS in which such projections play a vital role in the final decision , shouldn't the use of these projections to justify the interceptor be more strongly questioned? 1

Have the residents of the valley been asked if they want to be joined by another 135,000 people? Do the businessmen and local government reflect the general will of the valley? What will be the cost to the residents in higher sewage rates? If the growth is slow to come or doesn't come at all, what will be the cost to the residents? 2

Why was there not more attention given to the social and economic benefits of saving agricultural and wooded lands? The attitude reflected in the DEIS seems identical for both agricultural land and the general land use of the valley: all is lost anyway. Why was not mention made of the revised regional development plan of the Puget Sound Governmental Conference and the King Country Comprehensive Land Use Plan, which puts more emphasis on saving agricultural land and open space? 3

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The DEIS implies that development and growth will occur with or without the Auburn Interceptor, e.g. page 161, "It should be noted that most present trends are likely to continue regardless of the proposed action," and " This growth is probably irreversible." However, isn't it true that without the interceptor only about 40% of the land scheduled for development can be developed? 4

On page 145, the DEIS states that "it is EPA policy that wetlands are unique, valuable and irreparable water resources which require protection." Yet, aren't the Auburn 400 shopping center and industrial park scheduled to be built on wetlands and without the completion of the interceptor, they cannot be built? 5

The Purpose of EIS on page 5 states, "EPA must attempt, in this EIS, to evaluate impacts resulting from growth and development." I do not think that the EPA dealt adequately with these impacts nor that they gave sufficient attention to the alternatives that could prevent or reduce damage to the environment. A public agency given the mandate to protect the environment should not simply wash its hands of an area that could still be protected. The environment as it is now in the Green River Valley includes wetlands, wildlife habitat, riparian woods, streams, and wooded swamp land. Once they are wiped out, they will not return. Surely the EPA has a duty to protect that environment, not reliquish it so easily to industrialization and maximum development.

Sincerely,

D M Hartnett

D.M. Hartnett

RESPONSE TO COMMENTS BY
D.M. HARTNETT

1. As indicated in EPA comments to the Washington Environmental Council (#10) and to Mr. Aye (#3), the PSGC figures are the best available for the affected area and are the forecasts which have been regionally adopted.

2. See p. 92. Because the comprehensive land use plans are officially adopted by elected representatives and because the Auburn Interceptor is in conformance with these plans, it can be assumed that the project is consistent with the needs and desires of affected communities.

3. See revisions on pages 13, p. E-5 and E-6.

4. Whether 40% is the magic figure representing the amount of land that would not be developable without the interceptor is questionable. As discussed on page 98, however, an absolute prohibition of all incremental sewer sources, including the proposed interceptor, will stifle growth. Eliminating the Auburn Interceptor project will not in itself stifle growth since a number of alternative dispositions of sewer demand are possible.

5. Portions of the proposed site for the Auburn 400 shopping center and industrial park are indeed wetlands. This site is presently not sewered to accommodate commercial and industrial development such as the Auburn 400. As the provision of sewer service accommodates development, the operation of the interceptor or connectors to it may have a secondary impact on development in wetland areas presently not served by sewers by serving future development in these areas. In fact, the Metro-Auburn Sewage Disposal Contract (see Exhibit A of the Auburn Interceptor Environmental Impact Statement released by Metro in January 1974) states that Metro shall construct that portion of the West Valley Interceptor from 11th Avenue North (in Algona) to Main Street (in Auburn) within a reasonable time after the Auburn Interceptor shall have been completed and the City of Auburn shall have required such construction. Figure 8 of EPA's Environmental Impact Statement shows the North portion of the West Valley Interceptor as a proposed future extension. In any case, future shopping centers could be built without an interceptor, by installing waste treatment systems separate from the regional system.

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Puget Sound Governmental Conference

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May 29, 1975

Mr. Clifford Smith Jr., Regional Administrator
Environmental Protection Agency - Region X
1200 Sixth Avenue
Seattle, Washington 98101

Re: Auburn Interceptor (Green River Sewerage Area)
Draft Environmental Impact Statement
PSGC File No. EIS/44/75

Dear Mr. Smith:

Thank you for the opportunity to review and comment on the above referenced environmental impact statement. It is our determination that the proposed interceptor can be considered an issue of regional significance and, as a consequence, warrants an intensive review. This determination is based on the potential of the project to accommodate growth with attendant multi-county impacts affecting water and air quality, land-use patterns, and employment distributions; and, the potential primary impact on critical natural areas as designated by the Interim Regional Development Plan such as wetlands, marsh and bog sites, and floodplains. A further consideration is the potential for untimely urban development hastened by the provision of sewer service.

In the opinion of Conference staff, the draft environmental impact statement is generally adequate in addressing the primary and secondary impacts that can reasonably be expected to occur should the proposed interceptor be constructed. The Conference is encouraged by the Environmental Protection Agency's acknowledgment of the secondary effects of the project. In particular, Conference staff agrees with EPA's conclusion that:

- As growth and development accommodated by the interceptor intensifies "... surface water quality can be expected to decrease, stream flows probably will decrease during dry weather and increase during wet weather, and the potential for flooding could increase" (DEIS p. 157). It seems clear that the potential for flooding will increase as urbanization continued in the Green River Valley.

- Given present local comprehensive plans, the loss of wetlands, vegetation and wildlife habitat, including some potential habitat for rare, threatened or endangered species is unavoidable (DEIS p. 158).

- The availability of sewer service will increase the capacity of the area to accept development; development which may occur in advance of supportive infrastructure and services.

- "Any sewer system with built-in excess capacity which eventually will accommodate development in the valley will help make the need for development-oriented improvements, such as additional transportation and utility systems, and culverting and channelizing streams, more feasible." (DEIS p. 166)

- The magnitude of overplanning for industrial land in the Green River Sewerage Area is significant. "By 1990, the entire Central Puget Sound Region will have a projected demand for 7,006 acres of manufacturing land. Valley jurisdictions are planning for over 1½ times that much manufacturing land to be located just in the Green River Valley" (DEIS p. 94)

While the draft environmental impact statement adequately addressed potential impacts, the following are areas in which clarification or additional discussion would be useful.

- The DEIS (p. 115) states that newer collection systems have an infiltration/inflow rate of approx. 1100 gallons per sewered acre per day during wet weather, and that "... infiltration into the Auburn Interceptor is expected to be less". If this is an accurate statement, why is the larger figure of 1,100 GPD used to forecast peak flow (DEIS p. 65)? On what information is the infiltration/inflow rate of 3200 GPD for 1970 existing sewered area based? 2

- The DEIS (p. 164) states that the proposed line contains "... a certain excess capacity". While one of the factors contributing to this judgement of "excess capacity" apprears to be related to PSGC population projections for the year 2000, it is not clear what other factors are involved. Will the proposed interceptor serve a capacity beyond that projected by PSGC for the year 2000? 3

- A secondary growth-related impact has not been considered in this statement. The removal of gravel and other materials to be used as fill for development in the Valley may have significant adverse water 4

> quality and aesthetic impacts. It is suggested that the potential effect of extracting fill material from the Valley walls should be investigated.

We appreciate receiving the draft statement and hope that these comments will prove useful to you in preparing a final environmental impact statement. If you have any questions, please contact Barbara Hastings or Steve Holt at 464-7548.

Very truly yours,

Mart Kask

Mart Kask
Executive Director

MK:ce

RESPONSE TO COMMENTS BY
PUGET SOUND GOVERNMENTAL CONFERENCE

1. Attention is directed to pages 120, 125 and E-11 of the EIS. Although the effects of increasing urbanization could result in greater quantities of runoff and greater peak flows, proper planning and implementation of measures to provide the necessary controls could help prevent increased potential for flooding.

2. The 1100 gallons per acre per day for sewered areas, for newer sewer systems, is an acceptable design allowance for wet weather flows in a sewered area. As set forth in the draft EIS, p. 74, flow forecasts are based on serving about 22,000 acres by the Year 2000 and include infiltration/inflow allowances for interceptors, laterals, and side sewers expected to be built. With only a few direct connections to the Auburn Interceptor anticipated, it is expected that infiltration/inflow will be less for the interceptor itself than acreages containing more lineal feet of pipe per acre.

   Flow forecasts were developed by Stevens, Thompson, and Runyan, Inc. As stated on p. 65, existing sewered area as of 1970 was selected as the point in time where allowance for peak inflow and infiltration should be reduced from 3200 gpad to 1100 gpad. These values, originally developed by Metro for systems built before 1960, were used in the RIBCO study for systems built prior to 1970, although it was reported in the study that the 3200 gpad appeared to be somewhat high.

3. See our response the Aye letter, item 2.

4. Page 127 has been revised.

Director / Carl N. Crouse

Assistant Directors / Ralph W. Larson
Ronald N. Andrews

WASHINGTON GAME DEPARTMENT

Game Commission

Arthur S. Coffin, Yakima, Chairman
James R. Agen, LaConner
Elmer G. Gerken, Quincy
Claude Bekins, Seattle
Glenn Galbraith, Wellpinit
Frank L. Cassidy, Jr., Vancouver

DEPARTMENT OF GAME

600 North Capitol Way Olympia, Washington 98504

June 2, 1975

Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Attention: Jerry Parker, Office of Program Planning and Fiscal Management

Dear Mr. Thiel:

Your draft environmental impact statement - Auburn Interceptor (Green River Sewerage Area) King County, Washington E.P.A. Project C-530475-02 - was reviewed by our staff as requested. Our comments follow.

Your efforts to address the secondary impacts surrounding the proposed Auburn Interceptor Project, as well as more immediate primary effects, are commendable. Your report provides some valuable information on current land-use trends and planning endeavors. We concur with your contention that the major impact of the proposed project will be realized in its facilitation of growth in the planning area. Perhaps it is also the case that this particular proposed action cannot be held "responsible" for the growth facilitated by the project, since growth trends are already set by existing zoning and land-use plans. But the implications upon land use, natural resources and people in Puget Sound Basin must be considered in all decisions which affect this region's future.

Wildlife resources are generally addressed in an appropriate manner in your statement. The information you presented on wetlands and other valley habitats is well documented (pages 42-50). We noted references to Washington State Department of Game estimates on waterfowl use of wetlands (page 45) and wooded habitats (page 46). If these figures are taken from data collected for the Soil Conservation Service (SCS) Flood Control Program analysis, it should be recognized that changes in habitats remaining in the valley have occurred since those data were collected. Erosion of the habitat base has continued and, thus, wildlife resources have been subjected to continuing stress.

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Information on existing fishery resources is also well documented. We noted the bulk of data provided was taken from the Puget Sound and Adjacent Waters Study -- Appendix XI, Fish and Wildlife (page 51 through 55). It should be noted that data contained in that report were compiled to meet rather general objectives, and as such, has limitations. We acknowledge its usefullness as a source of information, but stress that site-specific information is necessary to augment data in PS&AW reports.

Wildlife and fishery losses expected with realization of anticipated growth levels are discussed in a general way (pages 145-154). Although some minimizing measures are discussed for primary impacts, we understood the report to say that habitat losses and degradation associated with growth, if they are to be lessened, must be ameliorated through proper land-use planning. Since a loss of 13,000 acres of wooded habitats, including 2100 acres of wetlands, is now expected for the future (page 148), it is clear that significant fish and wildlife resource losses would be involved in achieving currently forecasted levels of economic growth.

We question whether you have had any indication that current land-use trends and plans will be subject to future changes which will allow for a significant reduction in the wildlife resource losses now anticipated.

This brings us to a central question which your report raised. If current land use plans are unrealistic to some degree, as your report seems to imply (see below), what are the consequences surrounding implementation of sewerage improvements based on such plans? Does it follow that implementation of such proposed improvements will contribute to realization of plans which are, in part, undesirable? Your report indicated that sutdies by Corff and Shapiro and B. Bran of PSGC show overplanning for industrial land-use in the valley (page 94). It is stated, "...land set aside for industrial purposes in the Green River Valley is enough to accomodate all the manufacturing land use that can be expected to occur in the entire region by 1990 with 4,534 acres left to spare. This unused portion alone could accomodate all of the expected 1990 manufacturing land use in King County (2,390 acres)" (page 98, paragraph 1).

1

We can do little more than raise these questions as they deal with matters which are largely outside our areas of expertise. However as we submitted above, the future condition of valley wildlife resources will be largely determined by existing and future land-use plans. Therefore we hope you will give serious consideration to our questions.

Thank you for the opportunity to review your draft. We hope our comments will be helpful.

Sincerely,

THE DEPARTMENT OF GAME

E. S. Dziedzic

Eugene S. Dziedzic, Asst. Chief
Environmental Management Division

ESD:jb

RESPONSE TO COMMENTS BY DEPARTMENT OF GAME

1. Recognizing that the environmental impact statement is a valuable planning tool and an important public - information document, EPA found it appropriate to study the local land use plans and to stress the potential adverse ramifaications of uncontrolled growth. By discussing the problems inherent in the local land use plans EPA hopes to inform the public of the need to re-evaluate local growth policies and to take a closer look at what losses of resources might occur if growth continues unimpeded at current rates. Wildlife and fisheries losses can be expected if anticipated growth levels are realized and if land use and environmental quality controls are ineffective. Based on the information currently available, however, one cannot quantify the impacts urbanization will have on wildlife and fisheries.

   In response to your question regarding future changes in these plans and trends, we submit (1) the land use plans are not static entities - they must be subject to continual change if they are to be at all effective (2) it is not likely that the optimistic plans for the Green River Valley will be fulfilled. Studies have shown that escalation and costs, fluctuations in the regional economy and private market development decisions will collectively contribute to the dispersion of industial and commercial development throughout the region. It is likely that these developments will not be concentrated in the sewerage area. There is also every possibility that in the year 2000 the Green River Valley will still be left with a great deal of vacant and wooded land.

   As indicated on p. 94, the problems of overplanning and underplanning are common to comprehensive land use plans that are based on past growth trends and which do not consider how development is staged over time.

   Attention is also directed to p. 98, paragraph three, which states "An absolute prohibition of incremental sewer service will stifle growth - with whatever environmental dammage or benefits it may confer - but eliminating the Auburn Meterceptor project will not" (because alternative dispositions of sewer demand are possible).

May 29, 1975

Environmental Protection Agency
Region X
1200 6th Avenue
Seattle, Washington 98101

Re: Auburn Interceptor Draft EIS

Dear Sirs,

I am taking this opportunity to comment on the draft environmental impact statement issued by EPA on the proposed Auburn Interceptor. It is hoped that these comments will aid you in the drafting of the final impact statement.

Since the EIS is itself NEPA inspired, it is perhaps appropriate to include comments from the fifth annual report of the Council on Environmental Quality, another NEPA creation. These are also important because the project in the EIS is in opposition to some of the recommendations made by CEQ.

CEQ states that sewer interceptors have replaced highways as the major determinants of the location of developement. Interceptors often lead to leap frog type development and difficulties in planning other services. Interceptors are listed by the Council as a stimulus to development.

The stand of the statement is that growth in the Green River Valley will continue. This might contradict a statement made by an assistant regional EPA administrator that growth has slowed due to poor ambient air quality in the valley. The statement continues by saying that "adequate"wastewater systems and the availability of sewer service will increase the ability to develope and "could" accelerate the rate of growth and the appearance of urbanization. The statement remains indefinite as to the probability of growth and speaks only of the possibilities. While CEQ believes that the project will stimulate urban growth, the EIS does not commit itself. As this point would be a significant impact, the question of probability not possibility should be [illegible]. Moreover, it should be the extent of growth which should be examined since the area will surely urbanize. 1

A point above mentioned "adequate" wastewater systems. When the proposal arrived at the projected 72 inch sewer as being adequate, it was necessary to also project a 25 year future growth. CEQ says that such oversizing of sewers for future growth might be a self fulfilling prophecy. To alleviate this possibility, CEQ calls for a stepwise growth of sewer systems which would " significantly reduce adverse land use impacts" and provide for better planning of related systems, allowing them to better fill actual needs. Alternate Plan C fits this CEQ 2

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recommendation but is dismissed for being less cost effective and a possibility that a future branch sewer would have to be put through downtown Kent. CEQ says that it is important for federal agencies to lay aside cost and consider potential land use impacts.

Reasonably, a significant portion of the statement is devoted to water quality. It is important to note that a considerably portion of the water quality degradation of the Green River would not be controlled in the proposed action. The statement notes that "little improvement may occur in the reach between Auburn and Renton." It adds that little change in the bacterial concentration would be expected and that coliform, the major source of which is runoff, would not be eliminated by the interceptor. Since urban runoff is of such great importance to water quality, it is also significant that the proposed project makes no provisions for runoff control though urbanization and related losses in water quality are listed as adverse effects of the project. 3

Using computer projections based on population estimates used to size the interceptor, Soos Creek, a major source of bacteria and nitrate, is seen to become more loaded. The computer sees the Black River and Mill Creek having increased drainage problems by the year 2000.

Newaukum Creek half of the total load of coliform and nitrate in the Green River. The statement projects urbanization of the creek basin and channelization of the stream. This would have the recognized effect of raising coliform, nitrate, phosphate and suspended solid loads, increasing temperature, turbidity and the BOD, and raising the peak flowincreasing the chance of downstream flooding. 4

For the control of these secondary impacts, the statements lists some very often effective measures such as street washing, stormwater retention and infiltration galleries. Low flow augmentation, another measure, could be of great importance when the year 2000 effluent discharge of the Renton treatment plant equals the low flow of the Duwamish. This would probably seriously affect the return of anadromous fish which occurs at a time corresponding to low flow. The statement proposes offsetting fish losses by increased hatchery production, though it cannot directly implement this measure. 5

The statement recognizes the importance of the impact of runoff but the project takes no action to control the environmental effects of continued and increased area wide source pollution.

The statement maintains that it is the responsibility of local government and land planning to control runoff and the other adverse impacts of the project. But it may be argued that local planning is unable to control growth, developement and the related problems as is demonstrated by the national problem of urban sprawl. The statement mentions King County Ordinance 2281 concerning the establishment of stormwater retention plans as a local answer to urban runoff problems. But a reading of 2281 shows that while a plan of the proposed facilities 6 is often required prior to development, actual construction of the planned facilities is not enforced. Further, 2281 does not affect existing problems, requiring plans only when some activity, rezones, subdivisions, grading, etc. is to be conducted on the land. It is possible that by 2281, no measures may be taken to reduce the adverse water quality pressures of urban runoff.

Though it would be admittedly difficult for the project to control all runoff including that from secondary growth effects, a more effective, reliable means of control should be arrived at than the simple delegation of responsibility used by the statement. This might include a comprehensive stormwater runoff project in conjunction with the interceptor. CEQ says "Treatment of municipal and industrial discharges will not generally be sufficient to provide clean water in urban areas." EPA and Metro should perhaps take a second look at this statement. 7

Philip Wong
5255 1[illegible]th NE
Seattle, Washington 98105

RESPONSE TO COMMENTS
BY
PHILP WONG

1. Growth in the Green River valley will surely continue with or without an EPA-funded sewerage project. Recent growth probably has been slowed by the national economic situation but that will change. We stand by the statement the EPA support for the Auburn Interceptor could accelerate the rate of growth.

2. See item 4 response to Miller letter and item 8 response to Foulks letter.

3. As you note, urban runoff is important to water quality. However, agricultural runoff can also be significant. At present, runoff from agricultural areas is probably a major factor in the poor sanitary conditions of some tributary streams (such as Mill creek and Newaukum Creek). Although the proposed project makes no provision for future urban runoff or current agricultural runoff, some treatment of existing urban runoff will be provided. Storm runoff now enters portions of the Auburn sewer system resulting in possible overflows at several locations. With the proposed project, the Auburn Lagoon could become a temporary storage facility for storm flow, help eliminate overflows, and reduce the peak flows. This possibility is under consideration. New sanitary sewers will not be intended to collect storm runoff for treatment.

4. According to RIBCO simulations, Newaukum creek accounts for about half of the coliform and nitrate mass discharges to the Green River above Big Soos Creek (which is also above the Auburn discharge). Other sources and tributaries add to the river load further downstream. Although this tributary was projected to violate RIBCO's study criteria for ammonia, nitrate, phosphate, and coliform on more days in the year 2000 than at present, projected violations of the study criteria for BOD were less frequent.

5. Discussion of low flow augmentation has been expanded in the EIS. See pages 109, 112, 156, and E-11.

6. Note revisions on page 120. No penalties were established by the King County ordinance for non-conformance with the drainage plans submitted. However, persons constructing retention/detention facilities for runoff control are required to post construction and maintenance bonds.

7. EPA funding of a comprehensive stormwater runoff project in the Auburn area would be possible only if such a project were eligible on the State Priority List. This list and the priority rating system are prepared annually by the State of Washington and approved by EPA. Priority considerations include project type, project phase and water pollution control needs as well as miscellaneous considerations. Projects to provide adequate treatment for existing municipal wastewater discharges now take precedence in this priority system over projects for control of potential problems of urban drainage.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
4735 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98134

NPSEN-PL-ER

2 JUN 1975

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Richard R. Thiel, Chief
Environmental Impact Section M/S 437
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Dear Mr. Thiel:

We have reviewed the draft environmental impact statement on the Auburn Interceptor (Green River Sewerage Area), King County, Washington, EPA Project C530475-02, with respect to the Corps of Engineers' areas of responsibility for navigation, flood control, and hydropower. We submit the following comments:

We suggest expanding the discussions regarding the use of low flow augmentation from Howard Hanson Dam to mitigate the impact of the proposed Auburn Interceptor project on the water quality of the Green-Duwamish River. (See pages xii, xiii, 109, 112, 129 and 156.) This subject is of particular concern to the Corps of Engineers, which is responsible for water storage and regulation of water releases from Howard Hanson Dam. To date, we have not been formally contacted, nor involved in the planning of such mitigative efforts in relation to the Auburn Interceptor project. 1

In addition, the draft statement should include a discussion relating the proposal of low flow augmentation for water quality control, to the EPA's policy of not using water storage and water releases as a substitute for adequate treatment or other methods of controlling wastes at the source. The use of low flow augmentation is a practical method toward solving some water quality and associated fishery problems in the Green-Duwamish River. However, this method will require extensive study because it will affect, and be affected by other functions of the dam and uses of the water. 2

To clarify the relationship of the proposed project to the Green-Duwamish River environment, the draft statement should present more definitively the planned action to minimize the adverse environmental effects of the construction and operation of the Auburn Interceptor. 3

NPSEN-PL-ER
Richard R. Thiel, Chief

The statement presents mitigative measures that could be taken, but does not specify which, if any, of the measures will be used, or are planned to be used.

Also, please refer to page 23, third paragraph, first sentence. The word "permanently" should be deleted. The White River was permanently diverted in 1915 when a diversion dam was constructed to block the former channel. On page 26, second paragraph, penultimate sentence, the "North Fork" should not be included because it flows into the pool above the dam. 4

Thank you for the opportunity to review this statement.

Sincerely yours,

Raymond Eineigl

RAYMOND J. EINEIGL
Colonel, Corps of Engineers
District Engineer

REPORTS TO COMMENTS BY CORPS OF ENGINEERS

1. Pages 109, 129, 156, and E-11 have been revised.

2. It is EPA policy to treat municipal wastes to effluent limitations established in our regs (BPT or Secondary) or to greater degrees in water quality limited areas. Minimum water flows could have an impact on degree of treatment in some areas of the State.

3. Note revisions on pages 155 and 157.

4. Pages 23 and 26 have been revised.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Room 360 U.S. Courthouse, Spokane, Washington 99201

June 2, 1975

Mr. Richard R. Theil, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Dear Mr. Theil:

Thank you for the extension of time in which to review your draft environmental impact statement for the Auburn Interceptor (Green River Sewerage Area), King County EPA Project #C-530475-02. Such a review has been conducted at the field level by our personnel familiar with the area.

Figure 7 (map) is unclear to us as both Type I and untyped wetlands appear to have the same legend, making it difficult to determine the true type. 1

On Page 145, "General Impacts on Vegetation and Wildlife", the wording indicates that the disturbed area will be left to reestablish itself to either grass or shrubs. We would suggest that a plan for revegetating all disturbed areas be developed to reduce possible soil erosion and insure the establishment of desired vegetation. The plan may want to address itself to reestablishing vegetation that will enhance wildlife habitat and contribute to the aesthetic aspects of the valley. 2

The draft is well written and a great deal of preparation appears to have gone into putting it together. If the Soil Conservation Service can be of assistance to you on this or future projects, please call on us.

Sincerely,

ACTING
Galen S. Bridge
State Conservationist

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RESPONSE TO COMMENTS BY SOIL CONSERVATION SERVICE

1. Figure 7 has been corrected.
2. See revision on page 155.

May 29, 1975

Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Re: Draft Environmental Impact Statement on
Auburn Interceptor (Green River Sewerage
Area) EPA Project #C-530475-02

Dear Mr. Thiel:

Thank you for the opportunity to review this document. The coverage on most areas of the statement appears quite complete and thorough, indicating considerable forethought in preparation. You should be complimented on the preparation of this Draft EIS considering the magnitude of the project.

Review by our regional and headquarters staff members has produced the attached comments. We hope the comments will be helpful to you. Your effort in preparing the EIS will be of considerable benefit to understanding of interested citizens and agencies.

We appreciate the opportunity to have reviewed your statement. If we can be of further service to you, please contact Mr. David Thompson of our Environmental Review Section at 753-6892.

Sincerely,

James P. Behlke
Executive Assistant Director

JPB:je

Attachment

CC: Stu Messman, N.W. Region
Norm Glenn, Headquarters

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May 29, 1975

Department of Ecology's Comments:

Draft Environmental Impact Statement
Auburn Interceptor (Green River Sewerage Area)
EPA Project #C-530475-02

The population projections could be questionable. It is indicated that a constant rate of increase will occur over the next 20 years, based on a 1960 to 1970 rate of increase. As population densities increase there may be a tendency for the rate of population growth to decrease. 1

The analysis of water quality could possibly be based on additional and more representative data. The use of D.O. measurements taken during periods of low flow, high temperature and during the depressed period of the diurnal cycle would not truly be representative of existing conditions. Also, you cited measurements from a station located well below the Auburn area. 2

More information would be useful on the fish hatchery at Palmer regarding the BOD waste loading to the river when flushing the ponds. 3

RESPONSE TO COMMENTS BY
THE STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

1. Discussion on pp. 104-106 indicates that population projections for an area can vary depending on projection methodologies, the accuracy of past population figures, the expanse of the area covered, and the agency making these projections. EPA has used population projections provided by PSGC because these figures are the best currently available for the area in which the Green River Sewerage Area is located.

   EPA agrees that the rate of population growth may decrease as population densities increase. However, at what point in time (and density) such a change will occur is uncertain.

2. Existing water quality conditions were examined to identify the severity of the dissolved oxygen depression during a critical period. Although this approach does not define representative conditions, in the sense that other conditions prevail during most of the year, it is a way to determine the severity of existing problems. In the case of the Green-Duwamish River, this appraoch shows the lowest dissolved oxygen values at the first Metro station routinely monitored downstream from Auburn during 1974 were only slightly below the State water quality standard.

3. Wastes from the fish hatchery at Palmer may affect the water quality downstream (see p. 35 for revision). Computer simulations of water quality by RIBCO consultants assumed that BOD concentrations in the effluent were 2.3 milligrams per liter during September.

5206 15th NE
Seattle, Wash.
98105

June 1, 1975

Dear Mr. Thiel:

The following comments are on the water quality impact sections in the Auburn Interceptor DEIS.

Overall-The water quality impact sections were hard to read. Data were scattered and there was not enough tables to easily compare the data presented. Some of the flow data was presented in millions of gallons per day, mgd, other data in cubic feet per second, cfs. It would have been easier to compare values if all the units were the same.

On p.111 the DEIS states that "in the year 2000, the estimated dry weather flow from the Renton plant will be over half the river flow once in two years". It would appear that the percent of the river which is effluent will increase rapidly once the interceptor is built. During the month of September, 1974, the Renton plant effluent monthly average was approximately 8% of the Green River (U.S. Army Corps of Engineers and the September Renton Secondary Treatment Plant Monthly Report). The additional sewage of Auburn and vicinity could increase the effluent to the point where oxygen depletion could become a problem fairly fast.

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No estimations of the amount of treated effluent from Renton were given for any future time. These flow estimations should have been included to help assess the secondary impact of the Renton plant which is tied directly to the Auburn Interceptor. These estimations were included for the proposed secondary treatment plant in Auburn. If the percent of the effluent is consistantly high in the river, it could be more advantageous to have a secondary treatment plant at Auburn to furthur dilute the effluent, allowing some assimilation before Renton. This would help increase the dissolved oxygen in the Duwamish waterway. 2

In Table 31, sludge output estimations are given for 8% and 10% Auburn growth in the years 1983 and 2000. However, the assumption was made that the Renton Secondary Treatment Plant, including Auburn sewage, would produce the same amount of sludge independant of the growth of Auburn. This means that extra Auburn growth corresponds with less Renton growth. It would seem more realistic that the Renton, Auburn, Kent region may grow as a whole at a different rate than another region rather than part of this region growing faster and therefore slowing down another part of the region. A better purpose for the table would be to show the effect of different Renton-Green Valley regional growth rates and how they would effect the amount of sludge going to West Point. 3

On p.111 it is stated that chlorinated effluent was toxic to fingerling Coho Salmon. Metro in currently dechlorinating to remove the total residual chlorine. Some chlorinated compounds, tetrachlorophenol and pentachlorophenol (Characterization of the Effluent from a Metropolitan Seattle Wastewater Treatment Facility, Sammy Lee Archer, University of Washington, 1975) are not removed during the dechlorination. These 4 compounds could be a source of toxity when the effluent becomes a major portion of the Green River. Currently the compounds are found in trace quantities.

Thank you for the opportunity to comment on the Auburn Interceptor DEIS.

Sincerely

Peter Thorn

RESPONSE TO COMMENTS BY THORN

1. Growth Rates in the other areas served by the Renton sewage treatment plan, as well as growth in Auburn, will determine how rapidly the potential problems of oxygen depletion develop. Estimated future flows from the Renton plant, including the Auburn area, have been added to the EIS. See p. 111, paragraph 4.

2. Whether there would be an overall advantage to the Duwamish estuary from some assimilation of Auburn wastes in the river downstream from a secondary treatment plant at Auburn has not been fully answered. Although ammonia nitrogen may be converted to other forms of nitrogen during the travel time downstream (and alleviate the possible problem of ammonia toxicity), the likelihood of establishing a population of nitrifying organisms to exert significant oxygen demands in the Duwamish estuary may increase. This might increase the possibility of oxygen depletion in the Duwamish waterway. At this time, no answer is available.

3. The growth rate of 8% for all Renton treatment plant sludge was used by Metro for these preliminary projections; however, much of this growth is expected to take place in the relatively undeveloped Auburn and Kent areas rather than in Renton. For this reason, we felt it was appropriate to present an example estimate for Auburn's share that was higher than that for the Renton plant's service area as a whole. Although different regional growth rates would affect the amount of sludge going to West Point, the operation of the Auburn Interceptor and its impact on sludge depends only on the Auburn growth rate. Thus, no attempt was made to show different growth rates for sludge contributions for the region as a whole.

4. Toxicity from compounds not removed by chlorination is a recognized possibility. See p. 111, paragraph 5.

416 N.E. Mapleleaf Place, Apt. 7
Seattle, Washington 98115
May 31, 1975

Mr. Richard R. Thiel
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 6th Avenue
Seattle, Washington 98101

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Dear Mr. Thiel:

I have recently had the opportunity to review the Draft Environmental Impact Statement (DEIS) for the Auburn Interceptor project and would like to make a few comments as a concerned citizen. I have categorized my comments into four groups and will attempt to discuss them in these groups. The four groups are: (I) Air Pollution; (II) Population and Employment Projections; (III) Atlernative Growth Locations; (IV) Conclusions.

I. AIR POLLUTION

(A) Somewhat Higher

I would like to take issue with the summarization of the numerous sections about secondary air pollution impacts from the proposed project. While the DEIS has a very detailed analysis of projected secondary air pollution impacts which would seem to be immune from criticism, this analysis is clouded by subjective statements which summarize the results. It is stated, on page 143 of the DEIS, that secondary air pollution standards probably will be violated between 7 and 16 days in 1990 and that emissions will increase approximately 20%. Presumably these two statements are consistent with each other. The real problem arises when these two statements are translated into what appears frequently in the DEIS as, "concentrations of total suspended particulates were found. . .to be somewhat higher by 1990." (see page xii). 1
The key modifier, somewhat, implies that someone had judged the various possible levels of emissions, categorized these levels and found that the projected emissions will be somewhat higher, as opposed to maybe finding that emissions would be insignificantly or significantly higher. Anyone only casually reading this document is left with the results of someone else's subjective judgment and is not provided the information necessary to make his/her own judgment.

(B) Mitigable Alternatives

In the discussion of possible measures to mitigate the projected emissions increases, one alternative mentioned was to reduce the usage of the automobile as a result of energy constraints or improvements in mass transit, (see page 158). 2

This is a very curious statement. Currently, growth in the Auburn area is restricted: (a) by the size of plots necessary to support drainage fields and/or septic tanks; (b) the lack of excess capacity in the Auburn lagoon. The Auburn interceptor will provide the necessary capacity for expected growth, and will also allow more intensive development because of the removal of minimum plot size necessary to support drainage fields. This expected growth has an implicit activity pattern from which basic travel requirements are derived, e.g., home to work trips. The alternative mentioned above is supposed to affect the basic travel requirements, i.e., reduce them, either by constrainting the amount of travel or by shifting the travel to more efficient modes like carpool or transit. It is hoped this will reduce the amount of emissions. It seems that a more basic method to achieve this end would be to reduce the level of activity patterns allowed by scaling down the planned facilities like the Auburn interceptor. A reduction in the size of the interceptor will limit the overall level of growth allowed which in essence is what causes the travel requirements. It does not seem very appealing to allow certain activity patterns to be established and then try to restrict these patterns at a later time when the patterns themselves may be changed.

II. GROWTH PROJECTIONS

A. Reliability

This interceptor sewer project has been designed and evaluated based upon the best available population and employment projections for the affected area, (e.g. PSGC projections). These projections, as do any projections, contain certain assumptions upon which rely the results. At this particular time the regional growth projections for 1990 have already been revised downward once due to a change in some of the basic assumptions. This has occurred in the short time period of 1965-1974. As reported in pages 104-105 of the DEIS, there are two conflicting population projections for the study area, those of PSGC and OBER. While the PSGC projections are generally assumed to be more accurate, the difference still is significant. Finally, recent evidence stated in page 104 of the DEIS and generally acknowledged in the local planning circles is that the achieved population and employment growth for the region is behind the PSGC regional projections. The Metro design plans were based on the PSGC projections and the above three arguments cause several questions to arise. How good are the projections? Will they also be modified in another five to eight years? Will the residents and business establishments be paying for an over-sized facility if these projections are revised downward. 3

We are undergoing a period of rapid value change as a result of the Arab oil embargo. Basic notions of growth being good, the real costs of growth and whether we can afford growth from an energy standpoint are changing. With this value change in mind and the seeming uncertainties of the population and employment projections, maybe this is not the right time to commit a project such as the Auburn Interceptor.

4 An associated question to that raised above is: How appropriate is it to select between alternatives which may have uncertain futures? Specifically, while it appears the proposed interceptor project is most cost-effective of the alternatives investigated, it also seems possible that a superficially expensive alternative that is implemented in stages over a longer time period offers more flexibility to meet the projected uncertainty. It could be that in the end this staged project would be more cost-effective bacause if the growth does not occur facilities need not be built. Operationally, this type of question appears in none other than Metro's own literature, except for transit facilities. At least with regard to transit it is thought to be desirable to contain flexibility in plans, programs and projects. Maybe this idea can further be applied to sewer facilities.

(B) Local versus Regional Projections

5 A second area of concern with respect to growth projections involves the use of local versus regional projections. As stated many times in the DEIS, (i.e. pages 164-165; Impacts of Growth and Development), "With sound land use planning and zoning consistent with this planning, the adverse secondary effect of growth and development may be softened ---or--- may not occur at all." It is also stated in the DEIS that this planning is the providence of the local planning agency. The problem occurs when, as acknowledged on page 94 of the DEIS, the local planning agencies are currently dramatically overplanning for development. In example, the local jurisdictions are planning for over 1.5 times the manufacturing acreage forecast for the entire Central Puget Sound Region to be located in their jurisdiction alone. The basic question is can such land use questions be left to local agencies, as proposed in the DEIS, when examples of their lack of concern is so apparent?

III. ALTERNATIVE GROWTH LOCATION EVALUATION

6 This comment is a relatively simple one. On page 106 of the DEIS the following statement is made: "Given the overall level of development opportunities in the Seattle-Everett SMSA, development of the Green River Valley, with or without the Auburn Interceptor, is neutral with respect to energy consumption in competition with other parts of the SMSA..." My comment is, when was such a comparative analysis investigated? Where was it done and by whom? To my knowledge the only applicable study in this area has generally come from theses

completed as part of advanced degree programs in universities. Oddly enough one such Master's thesis was conducted at the University of Washington, in 1974, by James W. Clark and was circulated to local agencies. But this thesis did not address the specific question answered in page 106 of the DEIS.

IV. CONCLUSIONS

This project may seem environmentally insignificant, but it involves many perplexing problems faced today, especially those involving growth. In my comments I have stressed certain ideas important to me and where possible, seemingly important to EPA. The three areas my comments discuss are:

A. Simple criticisms of the DEIS, hopefully to be improved in the final EIS, (Sections I.A, and III);

B. Areas in which I think EPA has been specially charged as part of the Federal Guidelines for EPA that appeared in the Federal register (1-20-72). The most specific is: "The analysis of different courses of action shall include alternatives capable of substantially reducing or eliminating any adverse impacts, even at the expense of a reduced project objectives." (Sections I.2, and II.1); 7

C. Areas with which I disagree with the contention that it is not EPA's responsibility, especially considering the language of NEPA itself. For example, in section 2 of NEPA the following statement is made, "The purposes of this Act are: ...to promote efforts which will prevent or eliminate damage to the environment." This statement may be used to justify the use of the Auburn Interceptor as a lever to get more environmentally sound growth planning from the local planning agencies by EPA. (Section II.B). 8

I thank you for your time and interest in reviewing my remarks.

Sincerely,

Donald G. Miller

Donald G. Miller

RESPONSE TO COMMENTS BY
DONALD G. MILLER

1. Your point is well taken. The word "somewhat" will be deleted in the final EIS.

2. Growth potential of the Auburn Interceptor has been significantly reduced by scaling the project down from a 78" sewer to a 72". However, growth will occur without EPA funding of the project because economic pressures will exist in the Auburn area to stimulate growth. The rate of growth may be affected by the project but not the level. EPA encourages the use of mass transit as a positive way to control air quality.

3. The population projections used by Metro are the best available for the affected area and, for design purposes, are good. PSGC's figures are regionally adopted forecasts which are periodically updated. In all probability, the pipe size and interceptor cost will not change despite downward revisions of population figures since population forecasts are only one element of pipeline design. Consideration is also given to peak flows during wet weather and infiltration/inflow rates.

4. The project initially proposed by Metro was a facility to accomodate the flows projected for the year 2030. EPA believes it has recognized the uncertainty of a 50-year growth projection in the Green River Sewerage Area by limiting the alternatives considered to those based on a design period reduced to a maximum of 25 years, approximately one-half of the anticipated service life of this type of facility. In responding to grant regulations requiring that treatment works be designed to include adequate reserve capacity, EPA is unaware of any methods of completely eliminating an element of uncertainty in forecasting the course of future events. It is believed that the use of a relatively short design period for this type of facility reduces uncertainty to an acceptable level.

5. The fact that the comprehensive land use plans reflect a degree of overplanning for some land uses and underplanning for others does not necessarily indicate that the planners are not "concerned." This problem is common to many jurisdictions which prepare saturation development plans without considering the time elements involved. In view of the public ambivalence over economic and environmental issues it is difficult even for local planners to determine what constitutes "orderly growth" within their jurisdictions.

6. The statement on energy on page 106 was based on information provided by EPA's regional economist who has had considerable experience in national and regional economic and energy related studies.

   EPA did not make a detailed comparative analysis of net energy consumption effects of alternative growth patterns because the net differences were not considered large enough to warrant a detailed study. The statement is purely judgemental.

7. EPA believes that it has adequately identified a range of feasible alternatives which were properly evaluated in accordance with the cost effectiveness analysis guidelines set forth in 40 CFR 35, Construction Grant Regulations for Waste Treatment Works.

8. The land use plans in the Auburn Interceptor service area were done by local planning agencies and included opportunities for public participation. There are those who now criticize some of the plans, but it would be difficult to get 100% support for any plan. EPA feels strongly that local government and local citizens should make the local land use decisions. Our obligation is then to determine if a sewerage project is compatible with those locally-developed plans, and with Federal laws and regulations. We believe the Auburn Interceptor project is.

Rec'd EIS
JUN 6 1975

WASHINGTON ENVIRONMENTAL COUNCIL
107 SOUTH MAIN, SEATTLE, WA. 98104 / 623-1483

AAUW
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Hood Canal Env. Council
Intermountain Alpine Club
Junior League of Seattle
Junior League of Spokane
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Lake Stickney Garden Club
Lance Belfair
Lower Col. Audubon Society
Marine Technology Society
Montlake Community Club
The Mountaineers
North Cascades Conservation Council
Northwest Steelheaders
Nisqually Delta Assoc.
Oak Harbor Garden Club
Olympic Park Assoc.
Olympic Peninsula Audubon Society
Oroville Sportsmen's Assoc
Pacific County Env. Coun.
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Pilchuck Audubon Society
Planned Parenthood Center
Poggie Club of Washington
Progressive Animal Welfare Society
Protect the Peninsula's Future
The Ptarmigans
Puget Sound Beach Preservation
Puget Sound FlyFishing Club
Puget Sound Mycological Society
Pullman League of Women Voters
Queen Anne Garden Club
Ravenna Community Assoc.
Richland Rod and Gun Club
Save Cypress Island Comm.
Seattle Audubon Society
Seattle Garden Club
Seattle JC's
Seattle Veterinary Med. Assoc.
Shoreline League
Sierra Club - PNW
Skagit Alpine Club
Salty Beachcombers Club
SW Wash. Env. Action Team
Spokane Mountaineers
Spokane Audubon Society
Steelhead Trout Club
Tahoma Audubon Society
Thurston Action Committee
Wash. Alpine Club
Wash. Assoc. of College Biology Teachers
Wash. Assoc. of Sanitarians
Wash. Kayak Club
Wash. Roadside Council
Wash. Fed. of Garden Clubs
Wash. Recreation and Trails Assoc.
Wash. State Labor Council
Yakima River Conservancy
Zero Population Growth

June 2, 1975

Mr. Richard R. Theil, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Gentlemen:

We have completed review of the draft environmental impact statement on the Auburn interceptor (EPA Project #C-530475-02) prepared by the Region X EPA. Our findings are set out hereafter. Specific comments are directed to specified pages of the impact statement.

Funding of the Auburn interceptor is not consistent with the federal policies, regulation and directives which EPA is obligated to follow in awarding grants under P.L. 92-500 (Federal Water Pollution Control Act Amendments of 1972) nor is funding consistent with EPA's own policies and regulations. 1 The impact statement is also inadequate in the following respects:

1. There is no discussion of the funding requirements of EPA in relation to the proposed Auburn interceptor.

2. There is no justification given (a) for not complying with the directives of Executive Order No. 11296 relative to funding of facilities which likely 2

will induce construction in a designated floodplain, and (b) for not complying with the EPA policy to protect the nation's wetlands. The requirements of Section 6.304 (c) (4), of the EPA rules and regulation for preparation of impact statements, 40 FR 16189, reproduced below, have not been met.

> "(4) A discussion of how socioeconomic activities and land use changes related to the proposed action conform or conflict with the goals and objectives of approved or proposed Federal regional, state and local land use plans, policies and controls for the project area should be included in the EIS. If a conflict appears to be unresolved in the EIS, EPA should explain why it has decided to proceed without full reconciliation. (Emphasis added)

3. There is no mention of conditions to mitigate adverse environmental effects of the proposed action, such as we have alluded to in the impact appraisal included with the letter of January 10, 1975 of Robert S. Burd, nor any mention of how any such conditions would be implemented. The conditions mentioned in the letter are as follows:

> "..., EPA will condition its grant to METRO in a manner which will insure that wetlands will be protected."

> "EPA will condition their grant to METRO requiring they obtain agreements with their constituents to comply with DOE and Puget Sound Air Pollution Control Agency regulations pertaining to new and modified sources of air emisions. "

> "EPA will condition the grant to METRO to insure that not only those concepts of the Development Plan which impact the environment will be included in agreements between METRO and their customers but provisions for protecting against nonpoint source pollution will be included to protect the sewerage area's water quality." 3

> "Those avoidable significant adverse impacts on the noise levels, solid waste problems, habitats of rare, endangered, or threatened species of plants and animals, archeological and historical sites, and the use of flood-prone and slide-prone areas, will be eliminated by similar special grant conditions."

4. There is no identification or discussion of the overall projected costs to the public of the installation and maintenance of the extensive waste water collection and treatment system which the 4

sized capacity of the Auburn interceptor is to serve.

5. There is no mention of the projected increase in costs of sewerage collection, treatment and disposal to the residential, commercial and industrial users of the City of Auburn which will occur as a result of the Auburn interceptor. 5

6. There is no meaningful cost comparison of all of the alternatives discussed in the impact statement. None of the alternatives discussed include the costs of handling and disposal of sewage sludge or the cost effectiveness of the various alternatives in relation to existing EPA funding requirements. 6

7. There is inadequate treatment of the impacts of the proposed action on the prime agricultural land in the Green River Valley. 7

8. There is inadequate discussion of the proposed projects for the Green River Valley such as the SCS drainage project and the Corps of Engineers project, each of which will likely be justified on the basis of continued urbanization of the Green River Valley which the Auburn interceptor will facilitate. 8

9. There is inadequate treatment of the METRO policy of concentrating all effluent discharge at one or two locations and diversion of all sludge for digestion to the West Point Treatment Plant. 9

10. There are no reasons given for using the PSGC projections of population through the year 2000 as justification for the proposed project when it is recognized that they fail to take into account the reduced population growth that has taken place in recent years. 10

11. There is inadequate justification of the proposed action on the basis of improvement of water quality . No data are presented which would indicate that the present discharge from the Renton treatment plant is any more adequately treated than the wastewater presently being discharged into the Green River by the City of 11

Auburn treatment plant.

EPA and the Region X administrator of EPA have the responsibility under the National Environmental Policy Act (NEPA), the CEQ and EPA regulations developed pursuant to NEPA, the Federal Water Pollution Control Act (FWPCA) and EPA's regulations under FWPCA to assure that construction award grants for wastewater treatment works "will produce a project which will have maximum beneficial effects on man's environment and minimum adverse effects." The primary purpose of the construction grants program of EPA is one of water quality; however, water quality is not to be achieved at the cost of other environmental objectives. Grants should be made only for those projects which are consistent with federal, state and local policies and regulations. If it is not, it should be not funded, or effective and enforceable conditions should be imposed on the grant to reconcile conflicts between the proposed project and such policies and regulations. 12 Throughout the draft impact statement , funding of the Auburn interceptor is primarily justified on grounds other than water quality. Justification is based on a) conformance to METRO's Comprehensive Plan and the RIBCO recommendation, b) meeting the directive of the Department of Ecology and c) providing jobs in the community. Such reasons cannot and should not form the basis for funding of the Auburn interceptor. Although unstated in this draft impact statement the justification for the proposed interceptor appears to be for producing revenue sufficient to fund downstream facilities (Renton Treatment Plant expansion) built in anticipation of the Auburn interceptor. This is succinctly stated on page ix of the "Environmental Assesment of the Auburn Interceptor", November, 1973, prepared by Wilsey and Ham, Inc. as follows:

> "The proposed action is, however, as much a response to policy decisions made by federal, state, regional and local agencies during the last fifteen years, as it is a response to a potential or existing water quality problem. The proposed action represents a continuation of METRO's policy to serve the needs of an expanding urban area. An interceptor similar in size and location to the Auburn interceptor has been a part of METRO's Comprehensive Sewer Plan since 1958. Downstream facilities have been designed and constructed in anticipation of the upstream facilities, including the Auburn interceptor."

The Green River Valley through which the interceptor will extend is a designated 100-year floodplain, contains some of the best prime agricultural land remaining in Western Washington and 2330 acres of Type I and Type II wetlands. The federal government, by Executive Order No. 11296, in part reproduced below, established a policy of precluding, as far as practicable, construction of structures in designated floodplains.

> "(2) All executive agencies responsible for the administration of Federal grant ...programs involving the construction of buildings, structures, roads, or other facilities shall evaluate flood hazards in connection with such facilities and, in order to minimize the exposure of facilities to potential floods and the need for future Federal expenditures for flood protection and flood disaster relief, shall, as far as practicable, preclude the uneconomic, hazardous, or unnecessary use of flood plains in such connection."

13

The EPA policy to protect the nation's wetlands of February 21, 1973 establishes a policy of not funding "waste-treatment associated appurtenances which may interfere with the existing wetland ecosystem except where no alternative of lesser environmental damage is found to be feasible. (Emphasis added) King County, recognizing the value of prime agricultural land remaining in the Green River Valley has recently proposed an ordinance to preserve the agricultutal resources of the Valley. Funding of the Auburn interceptor by EPA is in direct opposition to the established policies ourline above.

Specific comments below are directed to the page or pages of the draft EIS.

p. xi (Paragraph 4). The project would result, not in elimination of the discharge to the Green River, but in transferring the discharge further downstream. No data are included which would indicate that the wastewaters presently being discharged into the Green-Duamish by the Renton treatment plant are any less inadequate than the wastewaters presently being discharged into the Green River by the City of Auburn. How and when would the project result in discontinuation of septic tanks in the Green River Sewerage Area? 14

p.xii (b) Why isn't land disposal of the sludge considered by EPA or METRO? 15

p.xiii(b) Why is the proposed project not being sized to prevent or minimize air quality problems? EPA has, in other locations, required size reduction because of potential air quality standard violations. 16

p.xiii(c) Why not take mitigative measures now? EPA is allegedley supposed to protect and enhance the environment , not fund projects which will result in or induce environmental degradation.

p.xiv Why not consider the alternative of pumping the effluent from the Auburn treatment plant into Puget Sound on the basis that the requirements for effluent disposal will be changed as presently being advocated by METRO? 17

p.4 What was the basis and justification for the NPDES permit? 18

p.7. The sererage area boundaries include the Lake Meridian area already served by the Cascade Sewer District. A Black Diamond interceptor is also being proposed to serve the Black Diamond-Lake Sawyer Lake Wilderness area for connection to the main METRO trunk line in Kent. Nothing is mentioned in the EIS about this already serered area nor is any reason given why this same area is included in the 19 sewerage area to be served by the Auburn interceptor.

p. 11. No map is included in the EIS giving the present status of land in Kent, Auburn and King County through which the interceptor will pass. No data is included justifying the statement "Large portions of the Green River Valley within the sewerage area, therefore, appear to be committed to open space or agricultural uses when in reality they are committed to industrial uses." 20

p.11. No identification of the designated 100-year floodplain is provided for that portion of the Green River Valley area through which the Aubrun interceptor will pass. 21

p.19. No data is included or referenced to justify the conclusion: "continued development of the Green River Valley may cause decreased employment elsewhere in the region." 22

p. 20 The relationship of the proposed interceptor to the SCS project and the Corps of Engineers project is not adequately covered. 23

p. 27. The dissolved oxygen problems in the Duamish would likely be made worse by the proposed action. These problems have not been addressed. 24

p. 31. What is the contribution of coliform by the Renton treatment plant? 25

p. 31. The reference (6) mentioned is not noted in the EIS. On p. 37 the reference (4) is not noted. 26

p. 38. Why the "special condition" for total coliform in the area of the Renton treatment plant discharge? 27

p. 55. No description and identification of prime agricultural lands which would be directly or indirectly affected by the presence 28

p. 60. The EIS is inadequate in not including a projection of 29 the costs of taking all of the waste water of Auburn and ultimately, the wastes for the sewerage area for which it is sized, to the Renton Treatment Plant, then piping all of the sludge to the West Point Treatment Plant, and then trucking the sludge to one or more disposal sites. On its face, the project does not make sense economically.

p. 78. No cost effective data are included for the alternative of upgrading the Auburn lagoon similar to that provided for the other alternatives so that there can be a meaningful cost comparison of each alternative. Further, none of the alternatives include projected operation and maintenance costs for handling and disposal of sludge. 30

p. 90. The Eis is inadequate in that there is no acknowledgement of the fact that in making a decision to fund the Auburn interceptor, EPA is making a "land use" decision for the area affected. 31

p. 91. The EIS is inadequate in not recognizing that a decision to fund the Auburn interceptor weakens the power of the municipalities affected and King County to make future land use decisions consistent with sound land use planning policies and principles. 32

p. 91. (4th paragraph) On p. 92 the EIS states: "...the growth stimulating role of the proposed interceptor must be dismissed as a critical issue." On p. 91 the EIS states: "Expansion of sewering is one of the pre-conditions for continued development of the Green River Valley. The two statements are contradictory. 33

p. 90-99. Additonal sewer service funded by EPA should, in terms of its own rules and regulations, "produce a project which will have maximum beneficial effects on man's environment and minimum adverse effects." Funding the Auburn interceptor will tend to encourage rather than discourage further industrialization and urbanization 34 of the Green River Valley. Providing funding for the interceptor is not consistent with the requirements of Executive Order 11296, and the EPA policy to protect the nation's wetlands, nor is the EIS adequate in meeting the requirements of Section 6.214(b) (2) and 6.304 (b) (4) and 6. 304 (d) of the EPA rules and regulations for preparation of environmental impact statements, 40 FR 16814 et seq. With reference to sec.6.304 (D) the environmental impact appraisal included with the letter of January 10, 1975 of Robert S. Burd, mentioned numerous grant conditions "to assure that EPA's objectives are accomplished." No mention of any such grant conditions is includes in the EIS together with a discussion of how the conditions would be enforced and how they would mitigate any adverse environmental impacts. Se. 6.512 (6) requires delineation of steps to mitigate adverse environmental harm. It states: 35

" This section shall describe structural and nonstructural measures, if any, in the facilities plan to mitigate or eliminate significant adverse effects on the human and natural environments. Structural provisions include changes in facility design, size and location; nonstructural provisions include staging facilities as well ad developing and enforcing land use regulations and environmentally protective regulations."

p.101-107. The EIS is inadequate in not including reasons justifying use of the PSGC population projections through the year 2000 when there is a recognition that they are overly optimistic in view of the 1975 actual population figures. 36

p. 136-144. The EIS is inadequate in that there is no relation of the data developed to the present and projected requirements of the Clean Air Act. 37

p. 157. Local governmental land use planning and control cannot be effective in avoiding severe environmental degradation if irreversible committments, such as the Auburn interceptor, are made for them. 38

p. 159. There is no projection of the increased costs for sewer service which will be intially borne by Auburn residential, commercial and industrial users and ultimately by residents within the sewerage area. 39

p. 161. Sec. 6.304 (f) of the rules and regulations of EPA requires that the "need for any irretrievable and significant committments of resources shall be explained fully." Though the draft EIS recognizes that the decision to fund the interceptor will result in an irreversible committment of future resources, there is no explanation of why EPA should fund the interceptor, other than statements that the interceptor is consistent with the comprehensive plan of METRO, the directive of DOE and the recommendations of RIBCO. 40

p. 164. (2nd paragraph) Is one of the purposes of the construction grant programs of EPA under P.L.92-500 to provide jobs in the community? 41

p. 164 (4th paragraph) The EIS is unclear as to how municipalities will be able to update and strengthen their comprehensive land use plans, zoning and other development ordinances and sewage facility plans by the "sewer system and the land use guidance identified in this EIS." 42

p. 165. The EIS is inadequate in not considering the value of prime agricultural land in the Green River Valley affected by the presence of the interceptor. (See PSGC Agricultural study) 43

Appendix E-2 . Was the cost effectiveness of an individual treatment facility considered by EPA as an alternative to the regional system proposed by METRO? 44

We appreciate the opportunity given us to review and comment on the draft EIS. We will be following with considerable interest EPA's course of action in the coming months. EPA thus far, has failed to justify funding of the project at all in view of its own internal policies and regulations developed pursuant to NEPA and FWPCA.

Sincerely,

Seattle Audubon Society

Thos. O. Wimmer

Thomas O. Wimmer
Director

Washington Environmental Council

Mike Galvin
President

Friends of the Earth

Dale Jones

Dale Jones
Northwest Representative

RESPONSE TO COMMENTS BY WASHINGTON ENVIRONMENTAL COUNCIL

1. We disagree. The project is fully compatible with federal laws, regulations, and EPA policy.

2. The EIS contains a discussion of the floodplain and wetland issue.

3. The impact appraisal was written with the concept of using grant conditions to force environmental evaluations and controls. The decision to write an EIS changed that concept to evaluation and selection as a function of the EIS conclusions. The EIS has looked at alternatives, considered environmental factors and selected the most acceptable project. The conditions specified in the environmental appraisal are no longer required because each of the areas of concern have been addressed in the EIS text. If grant conditions are still needed, the authors of the various sections who studied the situations should identify the unresolved problems to us and we will try to assist in developing appropriate language.

4. While the costs of sewerage collection, treatment, and disposal can be readily determined (see #5), the social and environmental costs of sewer provision are more difficult to identify and quantify. If the provision of sewer lines allows urbanization to occur in an uncontrolled, unplanned manner, the public costs associated with increased urbanization can be substantial. Though not expressed in monetary terms, the social and economic impacts of the interceptor are descriptively analyzed on pages 101-106. Attention is directed to the discussion of socio-economic trends (p. 18-20) which analyzes the tax burden on landowners, changes in land value, assessed valuation per capita, and other economic effects attributable to increased development. The discussion demonstrates that the costs of providing services, facilities, and utilities to developing areas are accrued to and paid for by the public.

5. At such time as the pending contract between Metro and the cities of Auburn, Algona and Pacific becomes effective, the Metro charge for each residential connection will be $3.55 per month. The charge for non-residential connections is to be based on water usage, with the standard residential charge applied for each 900 cubic feet of water discharged to the sewer system.

   The pending contract also provides for the reimbursement of more than $713,000 to the City of Auburn for facilities no longer to be used. This sum is available to the City for such purposes as sewer system improvements, sewer system debt retirement or other legal uses.

The additional cost for residential and non-residential connections for maintenance and operation of the sewer systems owned and operated by each of the municipalities will vary from one city to another, depending in part on staffing and salaries, complexity of the sewer system and whether any of the monthly service charge is applied to the redemption of bonds sold to finance construction. Elimination of the Auburn treatment plant would eliminate the costs presently chargeable to treatment and disposal at that plant. Costs for transmission, treatment and disposal at Renton would be included in the monthly Metro charge.

If increases in treatment, operation and maintenance costs are experienced by Metro and local governments, rates would have to be adjusted as necessary to meet expenditures.

6. See item 6 in Aye letter.

7. See additions on p. 13 and EPA's response to letters from Christine Foulks.

8. Additional discussion of the SCS and COE projects has been added to this final EIS. See p. 125 and E-11.

9. Effluent is discharged from five Metro treatment plants. All of these plants divert sludge to the West Point facility. Although the Renton treatment plant does divert sludge to West Point, the possibility of alternative disposition of Renton's sludge is now being studied. See p. 122.

10. The PSGC projection figures are the best available for the affected area and are the forecasts which have been regionally adopted.

11. Additional information on the treatment achieved by the Renton plant appears on p. 110. The possibility of failure of the Auburn lagoon to provide adequate treatment during a critical low flow condition would be eliminated by operation of the interceptor. Because other sources exist, removal of the lagoon's discharge as a source of nutrients may in itself have only slight initial benefits on the general water quality in the reach of the Green River between Auburn and Renton during normal river flows. Additional measures will probably be required to achieve and maintain water quality objectives in this reach. However, the interceptor will be a cost-effective solution to the long-term sewerage needs of the area and will eliminate future municipal waste discharges in this reach.

12. As stated before, the project is fully consistent with federal, State, and local policies and regulations. Meeting the directive of the DOE--the State agency charged with protecting Washington's environment--shouldn't be ignored. It is based on water quality needs, now and in the future, and is in conformance with the Federal Water Pollution Control Act.

13. Testimony received at the EPA public meeting held before the draft EIS was prepared included statements that the sewer service area is not prime agricultural land - one reason why so little farming is undertaken today. Any EPA project would be protected from the 100-year flood. Grant conditions would be applied to protect any unique wetland through which the sewer would pass.

14. Data showing a comparison between the treatment achieved by the Kenton treatment plant and the Auburn lagoon are shown on p. 110. Not all septic tank usage is expected to be discontinued by the Year 2000. It is anticipated that sewers will not be available in some areas.

    When sewer service becomes available to an area, facilities relying on septic tanks may be required to connect to the sewers. Thus, many septic tanks would eventually be replaced as sewage collection systems are extended.

    Extension will require construction by Metro of planned interceptors to connect the smaller collection systems in populated areas to the Auburn Interceptor. The population, population density and special needs of 1000-acre tracts are considered in planning interceptor extensions (see Ref. 1 as listed on page 134 for additional information regarding interceptor extensions). As local improvement districts are formed to request sewer service, the smaller collection systems that flow to interceptors would be constructed. According to county regulations, a connection to a sewer must be made within 60 days after notice of availability. This would phase out reliance on septic tanks. However, it is expected that some areas with low projected populations would continue to rely on septic tanks in the Year 2000.

    As noted on p. 65 (Table 15), the proposed Auburn Interceptor is sized to accept the flows anticipated from a sewered population of 175,858 in the Year 2000. This will include about 84% of the total projected population and 27% of the land area. Projected extensions of sewer service for each of the six basins are reflected in the figures shown for sewered acreages. For example, the sewered acreage for Basin 3, which is the West Hill including Lake Geneva, is planned to increase from 275 acres to 4,788 acres by 1980.

15. Land disposal of sludge is now used. However, Metro is studying several methods of sludge utilization. The feasibility of using digested sludge as a soil conditioner, especially on forest lands, is being evaluated now through research. EPA has participated in this effort through a research grant.

16. The EIS discusses environmental effects. EPA has required consideration of a 72" sewer rather than the 78" sewer proposed by Seattle Metro. Other agencies also have direct responsibility for protecting the Green River valley environment, e.g. an air quality maintenance plan is being prepared by local government, wetlands are best protected by State and local government through land zoning and/or outright purchases of the wetlands for permanent open space.

17. Unless the existing requirements for secondary treatment were met by Auburn by July 1, 1977 or the requirements for effluent disposal are changed, EPA could not participate in funding such an alternative. Without federal assistance, this does not appear to be a feasible alternative.

18. The Renton Treatment Plant NPDES permit was issued in accordance with Chapter 90.48 RCW State of Washington and the Federal Water Pollution Control Act Amendments of 1972, PL 92-500. The standards set forth are based primarily on requirements of the State's Water Quality Standards or on guidelines established by EPA.

19. Portions of the Cascade Sewer District are sewered at this time. Wastewaters from this system are discharged into Metro's existing interceptor in Kent and treated at the Renton plant. Discharge to Metro's interceptor is through the City of Kent system and, as described on p. 82, the wastes must be pumped twice before reaching the Metro interceptor. Also, as described on p. 82, the proposed Black Diamond-Lake Sawyer interceptor initially is planned to be connected to the Cascade Sewer District pump station. However, this area is serviceable by gravity flow to the Auburn area, and at such time as gravity service is available, it is planned to eliminate pumping, which will no longer be necessary.

20. Without adequate lead time, a new map cannot be added to the final EIS. However, a zoning map showing actual land use commitments is available for perusal at PSGC.

21. Pages 125, 126, and E-11 have been revised. The map prepared by the Corps which is discussed on page 125 was not available to EPA in time for inclusion in this EIS, but may be viewed at the Region X EPA office in Seattle, Washington.

22. The conclusion is a judgemental one based on the evidence that as employment rose during the nine year period (1961-1970) in the Green River Valley, employment declined in the Duwamish basin. Because there is no detailed evidence to substantiate this conclusion the sentence has been revised to read: "Based on these observations, one may speculate that the desirability for industry to locate in the Green River Valley may be one of the factors which has caused employment to decline in the Duwamish basin and, perhaps, elsewhere.

23. Discussion of the SCS drainage project and the COE flood control study has been expanded on pages E-11 and page 126.

24. The potential dissolved oxygen problem in the Duwamish is addressed on page 112. No immediate adverse impact on the dissolved oxygen problem in the Duwamish is expected since better waste treatment will be provided by the Renton treatment plant, as compared to the Auburn lagoon. See revised page 110.

25. See page 110 for additional characterization of the Renton discharge, including the bacterial loading.

26. See page 38A.

27. The area of the Renton Treatment Plant discharge and downriver sites were not designated as water contact sport areas because of the treatment plant and industrial waste discharges. The coliform standard established by the Department of Ecology therefore was based on the normal use of the water which was primarily fish passage and industrial use which do not require as stringent a standard.

28. Attention is directed to discussion on pages 94-98. The identification the exact acreages that may be lost through secondary impacts of the proposed interceptor (by 2000) is beyond the scope of the project. The primary agricultural land will be directly affected by the presence of the interceptor line in such a way that it will be taken out of production. Construction will take place within the right-of-way corridor.

29. See item 6 response to Aye letter.

30. See item 6 response to Aye letter.

31. The section has been revised to acknowledge the fact that EPA does recognize that its decision to fund the project may be a "land use" decision. See also discussion on page 92.

32. As expressed in paragraph four of page 90, it is EPA's intent that the decision to fund the Auburn interceptor will provide the municipalities affected the opportunity to re-evaluate land use policies and to develop comprehensive solutions to economic and environmental problems. That EPA's decision will weaken the power of these governmental bodies to do proper planning is extremely doubtful. Until National land use legislation is passed, local governments retain, in its entirety, the legal authority to control and direct the use of the lands within their jurisdictional boundaries. Zoning, which is solely in the hands of local governments, is and will continue to be the major mechanism by which land use is controlled.

33. As stated on page 91, the expansion of sewering is only one of the preconditions for continued development of the Green River Valley. As discussed in the fifth paragraph, growth and development are the result of a broad set of interrelated phenomena such as birth rates, migration, and the state of national, regional, and local economy. Clearly, therefore, growth is not solely dependent on the provision of sewers.

Discussion on page 92, paragraphs 2 and 3, provides rationale for the conclusion that the "growth stimulating role of the proposed interceptor must be dismissed as a critical issue." Basically, there are several alternative engineering configurations aside from the proposed project which can provide the same services and capacity for expansion in the service area. The long term impacts of each configuration are expected to be similar in scope and character.

34. In making a decision as to whether or not a project will have "maximum beneficial effects on man's environment and minimum adverse effects" all facets of those elements which comprise man's environment must be taken into account. While, on one hand, it should not be void of open space and aesthetic qualities, a good environment, on the other hand, does not preclude urbanization, or industrial development. It should reflect instead a harmonious and holistic integration of those amenities necessary to fulfill man's needs.

35. The Auburn Interceptor project is compatible with Federal rules, regulations and Executive Orders. The issue of grant conditions was previously discussed as was the action to consider a 72" sewer rather than the 78" sewer originally proposed by Seattle Metro. This reduction in size is a significant step to mitigate adverse environmental harm that may result from future growth.

36. As stated on page 106, there are potential problems with both sets of figures presented in Table 28. EPA has chosen to use PSGC's figures because these are the best currently available for the small area which encompasses the sewerage area and are the regionally adopted forecasts.

37. See page 39. It is not possible to project the requirements of future amendments to the CAA.

38. As this comment is similar to that made in item 32, attention is directed to EPA's response to that comment. See also response #5 to comments by Don Miller.

39. See item 2 response to Hartnett letter.

40. The stated reasons for funding the interceptor are all valid. The present Auburn sewerage system is in violation of the Federal law, State directives and doesn't allow for future growth.

41. See item 5 response to this letter.

42. This sentence has been revised to read: "The evaluation of the local comprehensive land use plans and the discussion of potential social, economic, and environmental impacts provided in the text of this EIS should prompt the public and local officials to re-examine their community goals and to prepare for anticipated growth."

43. Attention is directed to EPA's responses to Christine Foulks' letters and to revisions made on p. 13.

44. The alternative of providing a secondary treatment plant at Auburn, discussed on p. 78, is the alternative of an individual treatment facility. Cost effectiveness of this alternative is compared with this regional interceptor and treatment alternative on p. 87.

ASHINGTON STATE
HIGHWAY COMMISSION
EPARTMENT OF HIGHWAYS

ghway Administration Building
lympia, Washington 98504 (206) 753-6005

Washington State Highway Commission
Department Of Highways

Daniel J. Evans - Governor
G.H. Andrews - Director

June 2, 1975

Mr. Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

King County
Auburn Interceptor
Draft Environmental Statement

Dear Mr. Thiel:

Reference is made to your letter of April 18, transmitting a copy of the above impact statement for our review.

The statement lacks details concerning the impact the Auburn interceptor will have on highway facilities during the construction phase. However, the environmental statement for this project prepared and distributed by Metro earlier contained the necessary details. Also, we understand that all highway crossings will be accomplished by either jacking under the roadway or trenching in existing cross streets that pass under the highways. If these techniques are used, we feel that there will be little or no interruption to our highway service although drivers entering the highways may experience some temporary inconveniences on cross streets in the project area. 1

The EIS states that the proposed interceptor may stimulate the growth rate of development in the Green River Valley which would have a taxing effect on the existing road system in the area. We agree. Although the parameters of this growth rate are discussed, the extent of the traffic growth rate is not specifically mentioned nor does the document make any recommendations for any mitigation of the potential traffic problems. We feel that the necessity for expansion of existing highway corridors or the development of new corridors or alternate transportation systems is a reality with the extended development of the sewerage area. Without an efficient transportation system, air quality along existing highway corridors could deteriorate to a greater extent than that predicted and noise impacts, which were not considered, could rise to a significant level. 2

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Baker Ferguson, Chairman, Walla Walla · [illegible], Bremerton · Howard Sorensen, Ellensburg · Virginia K. [illegible], Seattle · Julia Butler Hansen, Cathlamet · Harold J. Bo, Secret

Also a permit must be obtained from this Department prior to undertaking construction within State Highway right of way. Coordination with the Department may be initiated through W. C. Bogart, District Engineer, 6431 Corson Ave. So., Seattle, Washington 98108. 3

Sincerely,

G. H. ANDREWS
Director of Highways

By: H. R. GOFF
Assistant Director for
Planning, Research and State Aid

HRG:eh
RA/RBD

cc: W. C. Bogart

RESPONSE TO COMMENTS BY
WASHINGTON STATE HIGHWAY COMMISSION

1. See our response to comment of U.S. Dept. of Transportation, Federal Highway Administration.

2. As stated on p. 98 of the EIS, "the availability of sewers may allow local jurisdictions to hasten the rates of urbanization of the land." Also on p. 98 of the Draft, the following statement is made: "In summary, the proposed interceptor: (1) Will facilitate development in the Green River Sewerage Area ---."

   The proposed interceptor is consistent with the IRDP, which includes a transportation plan as well as a sewerage plan, and which addresses projected traffic facility needs. It is understood that the Puget Sound Governmental Conference is making a study of impacts such as noise and air quality, related to transportation facilities. Impacts and mitigative measures related to a specific transportation project would be covered in the environmental assessment or impact statement prepared for that particular project, just as the Washington Department of Highways has done in its Draft EIS on SR 167, Sumner Vicinity to Auburn Vicinity, March, 1975, which project involves a portion of the Green River Sewerage Area.

3. See our response to comment by the U.S. Dept. of Transportation, Federal Highway Administration.

June 2, 1975

JUN 1975

To: Mr Clifford Smith, EPA
From: Christine Foulks, Seattle citizen
Re: comments concerning Auburn Interceptor

1. EPA has applied a type of circular reasoning to its discussion of the adverse impacts of the Auburn Interceptor. | 1

   a. The EIS states that the Interceptor is being built with excess capacity to accomodate urban growth.
   b. The EIS states that this continued urban growth trend will produce adverse impacts on the environment and quality of life in the Green River Valley.
   c. The EIS further states that these adverse impacts can be eliminated with "sound land use planning and zoning." (p. 164 - EIS)
   d. Yet in another section of the EIS, EPA notes that Valley jurisdictions are not practicing "sound land-use planning" (p. 91 - EIS)

What guarantee does the public have that these trends will not simply be continu

p. 2 - EIS comments
Auburn Interceptor

Reproduced from best available copy.

JUN 3 1975

2. EPA used a document in developing the EIS which was not available to the public. A PSCOG "in house" staff report not made available to the public is referenced on p. 15, on page 100, and p. 108. 2

3. EPA and other agencies have ignored citizen request to consider this project in light of its *regional* impacts. Citizens have repeatedly requested that a hearing be held in Seattle concerning the regional impacts: including the effect on the West Point treatment plant 3 and the drain on Seattle's employment and population caused by the projected growth in the Kent/Auburn area. 4

4. EPA has not included new sewage waste technology in its discussion of alternatives! 5

Thank you for your consideration of these issues.

Christine Faulks
12530 20th Ave NE, Seattle, 9812

RESPONSE TO COMMENTS BY
CHRISTINE FOULKS

1. Without growth policy constraints there is no guarantee that these trends will not continue. By open discussion of the potential effects of uncontrolled growth (which may, we might add, occur with or without the proposed project), EPA hoped to prompt the municipalities affected to re-evaluate land use policies and to develop mechanisms to deal with these predicted problems before they occur. For discussion of items a, b, c and d, see EPA's response #33 and #36 (Washington Environmental Council), #3 (Robert D. Aye).

2. The PSGC report, "The Green River Valley - A Discussion Paper" (Brian Beam) is available in its final form at the PSGC office. It is not merely an "in-house" report.

3. As the area most directly affected by the proposed project, the City of Auburn was selected as the most logical location for Metro's public hearing and EPA's public meeting. Both the hearing and the meeting were announced in a number of publications with wide distribution. In addition, EPA sent direct notice of its meeting to over one hundred agencies, groups, and individuals who had expressed interest in the project. EPA believes that all concerned parties were given ample opportunity to participate in the hearing and the meeting either by attending or by submitting a written comment.

   Records indicate that a representative of the Magnolia Community Club was present at Metro's hearing and EPA's meeting, and spoke about effects of the proposed action on the West Point treatment plant and surrounding area. These effects are discussed in both Metro's environmental assessment and in this impact statement.

4. Because of resource constraints, the "draining" effect the interceptor may have Seattle's employment and population is qualitatively and discriptively discussed on pg. 19. From what has been experienced in the Duwamish basin, it can be expected that this "draining" effect will be intensified by the interceptor.

5. EPA believes that it has adequately identified a range of feasible alternatives which were properly evaluated in accordance with the cost effectiveness guidelines set forth in 40 CFR 35, Construction Grant Regulations for Waste Treatment Works. EPA is unaware of any "new sewage waste technology" which could be identified as a feasible alternative.

Preserve Land for Agriculture Now
PLAN - King County
Box 5501, Seattle, WA 98105
May 30, 1975

Mr. Clifford V. Smith
Regional Administrator
Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

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Dear Mr. Smith:

Thank you for the invitation to comment on the recently completed Draft Environmental Impact Statement on the Auburn Interceptor. PLAN-King County formed in October of 1974 in response to concerns of county citizens over the conversion of agricultural land to urban uses which was occurring at an increasing and visible rate. It is appropriate that PLAN review the EIS for the Auburn Interceptor in light of this project's location in the center of a major King County agricultural area.

The most obvious and serious defect of the EIS prepared on the Auburn Sewer Interceptor is the absolute failure to address the importance of agricultural use of the land in the Green River Valley. EPA teats agriculture consistently throughout the EIS as a temporary, transitional use of minor, if any, importance to the citizens of this rapidly developing urban area.

A typical EPA comment: "Much of this land has been sold to investors and developers who are leasing the land to farmers until industrial development is feasible. Large portions of the Green River Valley within the sewerage area, therefore, appear to be committed to open space or agricultural uses when in reality they are committed to industrial uses." EIS, p. 11.

On a later page, EPA indicates that these lands are probably "committed" to industrial development which will never be feasible: "The magnitude of over-planning for industrial land becomes more apparent when viewed in a regional context. By 1990, the entire Central Puget Sound Region will have a projected demand for 7,006 acres of manufacturing land. Valley jurisdictions are planning for over $1\frac{1}{2}$ times that much manufacturing land to be located just in the Green River Valley." EIS, p. 94.

This type of contradictory "evaluation" of the future of the Green River Valley is found throughout the EIS. In addition, EPA has simply failed to recognize the existence of or make use of important documents produced by local agencies which identify the value to the public of retaining agricultural uses of the Green River Valley's prime agricultural soil.

EPA's ommissions in this respect include --

1. Failure to acknowledge the existence of or make use of the Regional Agriculture Report of the PSGC which was adopted in July, 1974, as the basis for developing regional policies for the preservation of the agricultural industry within all PSGC counties including King. Produced with the assistance of agricultural experts from WSU, this Report is a major technical document which outlines the extent and importance of agriculture in the Green River Valley and other farm districts in the county. It is inconceivable that an environmental impact statement could be developed in relation to a major public project in the Green River Valley without using the information and conclusions in this study.

2. Failure to acknowledge the existence of or make use of the EIS developed by the King County Planning Dept. con

2. Failure to acknowledge the existence of or make use of the EIS developed by King County Planning Dept. concerning the pending adoption by King County of Ordinance #1839 which would designate those areas of the county which are highly suitable for agriculture as being within a county system of agricultural/open space zones. Again, this is a major report which documents the value to the public of retaining agricultural uses of highly suitable land. If is difficult to understand why EPA did not acknowledge the existence of this report, especially in view of the over 3,000 acres in the Green River Valley which are still within the zoning jurisdiction of the King County Council. This acreage is currently zoned agricultural and is in agricultural use.

3. Failure to deal with the economic importance of agriculture in King County. EPA deals with the agricultural industry in King County as if it should be considered a "marginal use" of land, just one step above the land being actually idle. No recognition is given to the economic and social values of agriculture to the residents of the county.

4. Failure to deal with methods necessary to mitigate the adverse effects of this project on the agricultural industry still remaining in the Valley. EPA does not mention the effect that LIDs and other economic consequences of the project will have on farmers near the project area. Nor does EPA suggest methods of mitigating these adverse impacts on agriculture.

5. In relegating agriculture to the status of a transitional or marginal use of the land in the Green River Valley, EPA has chosen to ignore some important facts.. .

   ...King County produced agricultural products worth over $22 million in 1969-70. $6 million of this production was from crops requiring prime agricultural soil such as that in the Green River Valley; vegetables, berries, field crops, and horticultural products. $8 million was produced by the dairy industry, another current use of Green River Valley land. (PSGC Ag. Report, Appendix A, Table 3)

   ...The 12,550 acres of Class II soil in the Green River Valley which has not yet been converted to urban uses represents 22% of the available prime agricultural soil in King County. (PSGC AG. Report, p. 58)

   ...King County residents consumed 59,053 tons of vegetables in 1970 of the variety that are commonly grown in King County. In 1970, King County production of these vegetables was 18,950 tons or 32% of the estimated consumption. (Consumption estimate based on national figures) Considering King County residents make up over 30% of the state population, this indicates the importance of the productivity of King County cropland. (King County EIS on Agriculture as Open Space, p. 20-21)

   ...The major acreage currently being farmed in the Green River Valley lies within unincorporated King County jurisdiction, not in the 75% of the land area controlled by incorporated cities. (See EPA EIS, p. 165) Out of 4,614 acres currently being farmed in the Valley, 3010 is within the jurisdiction of King County. (King County EIS, p. 17) while most of the available farm soil does lie within the borders of the incorporated cities, it is now mostly idle, being held out of agricultural use. The 3010 acres in King County jurisdiction is in agricultural zoning and is subject to hearings to discuss Ordinance 1839 which would retain this zone.

   ...King County shares with Pierce County the entire state production of rhubarb. These two counties produce over 90% of the U.S. rhubarb crop. (U.S. Census of Agriculture, 1971)

...King County's rank in state production of specific vegetables has not changed much since 1964 —

Crop	1973	1969	1964
Snap beans	4	3	1
Broccoli	-	3	3
Cabbage	2	1	1
Carrots	10	9	8
Cauliflower	2	2	2
Celery	2	1	1
Sweet corn	11	11	9
Cucumbers	2	6	3
Lettuce	3	1	1
Green peas	-	-	1
Rhubarb	2	2	2
Turnips	-	3	2
Spinach	-	2	2
Tomatoes	6	2	2

Rank in relation to other counties in Washington state production

(Washington Agricultural Statistics, 1973, 1969, 1964 Reports)

...King County has a longer growing season than counties east of the Cascades.

Frost-free days - (Atlas of the Pacific Northwest, p.34)

Seattle -268
Ephrata -190
Yakima -184
Oroville -172
Spokane -164

This long growing season is accompanied by a moist, mild climate which is ideal for growing berry crops and leafy, green vegetables. This is why King County has retained a high rank in production of these crops in spite of the heavy urbanization pressures farmers here are subjected to. The statement by EPA on p. 165 of the EIS ("Farming this valley is difficult because of the weather conditions. etc.....) is incorrect and that section should either be eliminated from the EIS or it must be documented. This EPA statement is in direct contradiction of a conclusion of the PSGC study of agriculture: "From the standpoint of physical factors, the soil and the climate, agriculture appears to have a very viable base in this region, capable of sustaining itself indefinitly into the future. In short, the physical determinants of this region's agriculture have remained stable and cannot account for the declines in the regional agriculture noted in Chapter 1." (PSGC Ag. Report, p. 58)

In summary, PLAN recommends that EPA recognize the validity of agricultural activity in the Green River Valley, recognize the impact this sewer project will have on that activity, study the local agency documents outlining the importance of agriculture to the public, and deal with these issues in the EIS.

Thank you for your consideration.

Christine Foulks

Christine Foulks
PLAN -King County

RESPONSE TO COMMENTS BY PLAN

The comments made by Ms. Foulks are both cogent and substantive. The letter is, in itself, a valuable addition to the impact statement. Changes have been made in the text (p. 13-14; 165) to recognize the Regional Agriculture Report of the PSGC (July, 1974). While there is no Congressional directive that allows EPA to determine what land should be put to what uses, EPA does encourage elected officials and the public to recognize the status of agriculture as a competing land use and to support the development of effective regional policies for the preservation of this industry.

Attention is also directed to the section on Land Use Impacts as there is a discussion of the possible extent of development by the year 1990 if growth is allowed to continue unimpeded.

Advisory Council
On Historic Preservation
1522 K Street N.W. [illegible]
Washington D.C. [illegible]

May 27, 1975

Dr. Clifford V. Smith, Jr., P.E.
Regional Administrator
Region X
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Dear Dr. Smith:

This is in response to your request of April 18, 1975 for comments on the draft environmental statement (DES) for the Auburn Interceptor (Green River Sewerage Area), King County, Washington. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council has determined that the DES appears adequate concerning compliance with Section 106 of the National Historic Preservation Act of 1966.

However, with respect to evidence of compliance with the provisions of Executive Order 11593, "Protection and Enhancement of the Cultural Environment" of May 13, 1971, the Council notes that the undertaking as proposed will result in an effect to the Seattle-Tacoma Interurban right-of-way, a property which may be eligible for inclusion in the National Register of Historic Places. Because this property may be eligible for inclusion in the National Register, it is entitled to the protection afforded it by the Executive Order 11593. Therefore, in accordance with Section 800.4(a)(2) of the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800), which sets forth the steps for compliance with the Order, the Council requests the Environmental Protection Agency (EPA) to request in writing an opinion from the Secretary of the Interior respecting the Seattle-Tacoma Interurban right-of-way's eligibility for the National Register and inform us of the findings. Should the Secretary determine the property is eligible for inclusion in the National Register, then EPA should follow the remaining steps in Section 800.4 to evaluate the effect of the undertaking upon the property.

In addition, the Council notes that an archeological survey of the project area will be preformed prior to construction. The Council wishes to remind EPA that should cultural resources be discovered which are subsequently determined eligible for inclusion in the National Register, it is required to afford the Council an opportunity to comment on the appropriate action necessary to preserve those resources pursuant to the procedures.

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Until the requirements of the Executive Order 11593 and the procedures are met, the Council considers the DES to be incomplete in its treatment of historical, architectural, archeological and cultural resources. To remedy this deficiency, the Council will provide substantive comments on the undertaking's effect upon such resources through the process set forth in the procedures. Please contact Michael H. Bureman of the Council staff at P. O. Box 25085, Denver, Colorado 80225, telephone number (303) 234-4946, to assist you in completing this process as expeditiously as possible.

Your continued cooperation is appreciated.

Sincerely yours,

Louis S Wall

Louis S. Wall
Assistant Director
Office of Review and
Compliance

cc:
Sheldon Meyers-EPA:FLO

June 10, 1975

10A

Re: Metro Auburn Interceptor
Project No. C-530475-02

U.S. Department of the Interior
Office of the Secretary
Washington, D. C. 20240

Dear Mr. Secretary:

An Advisory Council on Historic Preservation review of the Region X Draft Environmental Impact Statement (DEIS) for the Auburn Interceptor, a proposed wastewater treatment works grant project near Seattle, Washington, determined that the proposed project would affect the Seattle-Tacoma interurban railroad right-of-way. This property may be eligible for inclusion in the National Register of Historic Places (Advisory Council comments attached). The property is presently on the State of Washington's Register of Historic Places. Pursuant to Executive Order 11593 and its implementing regulations (36 CFR Part 800), Region X requests the Secretary of the Interior to conduct a review of the property's eligibility for inclusion in the National Register. If the property is found to be eligible for inclusion in the National Register, Region X will evaluate the proposed project's effect on the historic property pursuant to 36 CFR Part 800, Section 800.4.

A similar effect analysis was conducted by Region X during the environmental impact statement preparation process. Though the interurban railroad right-of-way is located within the "direct impact area" of the proposed project, Region X determined that no effect would be likely. Because the proposed Auburn Interceptor will be underground, with grade-level manhole covers being the only visible evidence of its presence, it would not have any permanent impact on the aesthetic, open space, recreational, or historic values of the property. Any impact during construction will be temporary since disturbed surface areas will be restored. No changes, beneficial or adverse, in the quality of the historical or cultural character that may qualify the property for inclusion in the National Register will result from the proposed EPA action. The Chief of the Washington State Office of Archaeology and Historic Preservation has concurred with Region X's evaluation that little direct impact on the interurban railroad right-of-way will result if the Auburn Interceptor is constructed (State Historic Preservation Council comments attached).

We have attached some representative photography and maps which display the relationship of the proposed Auburn Interceptor and the interurban railroad right-of-way to assist in your evaluation of the property. Adjacent to the proposed interceptor's corridor, much of the interurban railroad right-of-way consists of a marshy drainageway, interrupted by crossroads on filled embankments and fencelines with accompanying shrubs and riparian vegetation. Portions of the right-of-way contain a dirt access road, which is planned to eventually become a segment of the King County Trail System. Little recreational use occurs at this time, however. The only notable feature of the right-of-way near the proposed interceptor's route is the remains of a trestle from the interurban railroad, located immediately south of South 277th Street in King County. The Puget Sound Power and Light Company utilizes the interurban railroad right-of-way as a transmission line corridor, and the Olympic Pipeline Company utilizes the right-of-way for an underground petroleum products pipeline transmission route.

An expedient review of the status of the interurban railroad right-of-way would be greatly appreciated as we are on a critical time schedule for determination of the appropriate EPA administrative action.

Sincerely,

Clifford V. Smith, Jr., Ph.D., P.E.
Regional Administrator

Attachments

cc: Roy H. Sampsel
Advisory Council on Historic Preservation (Louis Wall and Michael Bureman)

Robert D. Aye, P. E.
4145 11th Ave. N.E., Apt. 31
Seattle, Wash. 98105

May 31, 1975

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Mr. Clifford V. Smith
Regional Administrator
U. S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

Subject: Draft Environmental Impact Statement
Auburn Interceptor
King County, Washington
EPA Project #C-530475-02

Dear Mr. Smith,

I have had the opportunity to review the subject Draft Invironmental Impact Statement and offer the following comments for your consideration in preparing the Final EIS.

While I feel EPA is to be commended for addressing the secondary impacts of the project, there are some very essential issues which have not been adequately evaluated:

1. Of utmost importance in making a decision on the Auburn Interceptor is the presentation and evaluation of METRO's Comprehensive Sewerage Plan for the Green River Valley including future interceptor extensions; i.e. West Valley, Dolloff Lake, Lake Geneva and East Green River Valley interceptors. The Draft EIS (pg. 161) states that "the interceptor will probably commit future generations to specific actions and resource uses in managing water quality in the Green River Sewerage Area." The Auburn Interceptor, therefore, will preclude consideration of alternatives on future collection and treatment systems. How can EPA rationalize treating these actions as independent projects when they depend on construction of the Auburn Interceptor? 1

2. It is essential that EPA identify the excess capacity of the Auburn Interceptor. Will the interceptor actually provide for capacity beyond the ambitious PSGC projections for year 2000? The Draft EIS (pg. 164) states that the proposed action "includes a certain excess capacity" and (pg. 105) that "the design projections seem disproportionately ambitious." This oversizing can contribute to the extent of development that occurs and, consequently, may become a self-fulfilling prophecy. 2

The Draft EIS (pg 106) states that "the PSGC figures are, at this time, the best available for the small area which encompasses the Green River Sewerage Area." I find this statement rather difficult to accept considering the magnitude of the differences between the OBERS and PSGC projections as shown in Table 28. If in fact the OBERS projections are more nearly correct, the population for year 2000 for the sewerage area would be approximately 130,000 rather than the 175,858 projected by PSGC. Since the PSGC projections "fail to take into account the pronounced reduction in population growth that has taken place in recent years" and the interceptor is based on these projections, this issue requires further examination. The PSGC projections are also based on the assumptions that the Auburn Interceptor and associated sewers would be in service prior to 1990. Here again construction of the interceptor is self-fulfilling in insuring that the projected growth will occur. 3

There appears to be an error in Table 26 (pg. 104) in that two estimates are indicated for the year 2000. 4

3. What will be the actual increase in cost to the taxpayer for the sewerage service to be provided (sewerage rates)? How is this cost affected if the projected growth does not occur as is likely? The public costs associated with urban development can be substantial and usually accrue to the taxpayer. What is the estimated cost to be incurred as a result of providing other services, facilities and utilities to accomodate the projected growth? 5

4. The alternatives presented are basically examples of the traditionally static design approach. The alternatives are not flexible in that they either provide for the design year growth or no growth. Staged construction of a regional treatment plant at Auburn might allow future generations some choice on wastewater management and keep cost in phase with growth. 6

5. Stronger recommendations must be made for mitigating measures (conditions of grant) to insure that adverse impacts are avoided. The overplanning for industrial growth by local agencies and Auburn's uncompromising position on conflicts between their land-use plan and the Puget Sound Governmental Conference's IRDP are, in my opinion, indications that the local agencies cannot be relied upon to implement regulations which would limit adverse growth or devepment. 7

The remaing comments are more specific and deal primarily with Water Quality and Vegetation, Wildlife and Fisheries Sections of the Draft EIS.

WATER QUALITY IMPACTS:

1. Coliform organisms not only will probably not be eliminated by an interceptor, but are likely to increase as a result of increased runoff (pg. 109). 8

2. How will the percent removal of suspended solids and BOD of the Renton Treatment Plant be affected by the increased load of Auburn's waste? If BOD removal efficiency (pg. 110) is high because of the high sugar content of whey waste as noted by DOE, this removal will be reduced by increasing the waste load. 9

3. How does the insignificant benefit in the water quality of the Green River between Auburn and Renton warrant transporting Auburn's Waste to the Renton plant? Augmenting low flow conditions in the Green River with the Auburn discharge may outweigh benefits of discharging at Renton. The discharge of Auburn's waste at Auburn would have a significant effect on the flow between Auburn and Renton in the year 2000. 10

4. Has the possibility of the City of Tacoma increasing diversion from the upper Green River been evaluated? 11

5. With the growth and development that will stimulated by the Auburn Interceptor additional low flow augmentation at Howard Hansen Dam seems inevitable. Who will pay for this action? What impacts will this action have on people outside the sewerage area? 12

6. Urban drainage, in addition to increasing in quantity and decreasing in quality, will become more significant in relation to the water quality of the Green River as septic tanks and other point sources of pollution are eliminated; therefore, this problem should be addressed further. Detailed regulations to minimize the effects of urban runoff should be made conditions of the EPA grant. 13

7. The Draft EIS (pg. 128) states that for design of the secondary treatment works at Auburn "a high estimate of infiltration/inflow into the sewerage system was used." Excess capacity of the plant and associated interceptors, trunks, etc. increases the cost of this alternative. Why would the infiltration/inflow rates of this system exceed those anticipated for the Auburn Interceptor? 14

In my opinion, the alternative of secondary treatment at Auburn has not been objectively evaluated. Why, for instance, would a secondary plant at Auburn achieve less BOD and SS removal than the existing secondary plant at Renton? 15

Since low flow augmentation by a modified Howard Hansen Dam will probably be implemented, the impacts of the alternatives should be compared under the same augmented flows. 16

NATURAL VEGETATION, WILDLIFE AND FISHERIES IMPACT:

1. An alternative alignment avoiding the unique wetland area south of South 277th Street should be evaluated and measures outlined to avoid impacting this wetland. A statement (pg. 156) that "a petroleum pipeline was constructed through this area several years ago, with no apparent residual effects" is not substantiated by fact since no study has been made of quantitative effects upon the wetland. With increased growth and development since the petroleum pipeline installation, the wetland is now more important to preserve and probably more sensitive to change. 17

2. Considering the existing water quality problems in the Duwamish Estuary, mitigation will be crucial to maintaining the fishery and should be an integral part of any grant approval. It is my understanding from a conversation with a representative of the Washington Department of Fisheries that low flow augmentation has been necessary in the past to flush out the Duwamish Estuary to protect fish during salmon runs. 18

I would question the statement (pg. 157) that "water quality impacts on native fishery could be mitigated by increases in hatchery-produced fish." If the water quality results in the decrease in the fishery, how are hatchery-produced fish to survive? Also, who pays for the increased cost of producing fish? Will the sewerage agency bear the cost and in turn pass it off on the taxpayer? 19

SUMMARY OF COMMENTS:

1. EPA should present and evaluate the entire sewerage plan for the Green River Valley prior to deciding upon an alternative.

2. Excess interceptor capacity should be identified.

3. Actual cost to the taxpayer for sewerage service should be presented.

4. A dynamic alternative should be evaluated which would allow future generations some choice in wastewater management and keep costs in phase with growth.

5. Mitigating measures should be made an integral part of grant approval.

6. Various impacts on Water Quality and Natural Vegatation, Wildlife and Fisheries need further clarification.

Sincerely yours,

Robert D. Aye

Robert D. Aye, P. E.

cc: Keith W. Dearborn
Barbara Hastings, PSGC
Martin Baker, WEC

RESPONSE TO COMMENTS BY
ROBERT D. AYE

1. EPA's draft environmental impact statement has addressed the entire area which could be served by the proposed action or by any of several of the alternatives considered. Metro's comprehensive plan, based on the drainage basin concept to minimize the need for pumping and to limit point source discharges, was adopted in 1959 and re-evaluated by Metro in 1968, by the consulting firm of Cornell, Howland, Hays & Merrifield in 1972, and by RIBCO in 1974.

   As found in these re-evaluations, Metro's comprehensive plan still appears to offer the most satisfactory method of managing water quality problems in the Green River Sewerage Area. The Auburn Interceptor is consistent with the comprehensive plan and has been identified as the focal point for gravity drainage of much of the sewerage area. Although only a minor segment of the total facilities which may be necessary if sewer service to the area is provided. The interceptor does represent a commitment to continue with the comprehensive plan and, unless new technologies are developed or the factors affecting growth patterns are significantly altered, it is probable that future extensions will conform substantially to the present plan.

   Since Metro's comprehensive plan is subject to revision if conditions change, EPA deems it more appropriate to evaluate future projects which their need and suitable alternatives can be more clearly identified.

2. In its entirety, the sentence on p. 105 referring to design projections is as follows: "Since continued population growth in Puget Sound is not inconsistent with static or declining national population, the design projections seem disproportionately ambitious and do not appear to adequately reflect national demographic trends." In context, this statement is intended to relate an apparent difference in a local and and national growth trend, not to identify an erroneous population projection.

3. These comments are well taken as they do reiterate EPA's concern with the different sets of population projection figures. As stressed on page 106, there may be problems with both sets of figures. However, both PSGC and RIBCO growth projections appear compatible at the year 2000.

4. The error in Table 26 has been corrected to read 1990 rather than 2000.

5. EPA determined that to attempt to quantify the costs of providing other services, facilities and utilities to future populations in the valley would be a formidable exercise in terms of time and money and the end result of which may be questionable. Such a task is also beyond the scope of the proposed project and the expertise of the EPA staff. See item 5 response to the WEC letter.

6. A cost comparison, based on EPA's Cost Effectiveness Analysis Guidelines was made of all of the alternatives planned to meet projected year 2000 flows. Estimates of current project cost were made for a year 2030 design interceptor and for upgrading the existing lagoon system at Auburn with no increase in capacity. A cost effectiveness analysis was not made for the 2030 interceptor since it was determined that uncertainties relating to long term growth projections made this alternative unacceptable; cost effectiveness of the upgrading alternative was not made since it provided only a temporary solution, with the probable future solution being provision of an interceptor facility or treatment plant, similar to those alternatives which were compared, unless artificial constraints on sewer service are reimposed.

   As set forth on p. 78 of the draft EIS, the alternative of a regional treatment plant at Auburn, with capacity of 35 mgd for the year 2000, was one of the final configurations developed for the Metro service area in the RIBCO study. These final configurations resulted from a screening process applied to a large number of alternative systems combining various configurations of existing and proposed facilities.

   The cost comparison shown on p. 87 of the draft EIS includes estimates of operation and maintenance costs for a secondary treatment plant at Auburn and the proportional O&M costs for treatment at Renton. These estimates, made by Stevens, Thompson & Runyan, Inc., were based on the same cost curves used in the RIBCO study, adjusted to reflect the present cost index. Although not shown separately, these costs include allowance for treatment, sludge handling and sludge disposal, as described on p. 114 of the RIBCO Main Report. No additional construction cost would be required for transport of sludge to West Point, since these facilities are already built.

   The Cost Effectiveness Analysis Guidelines define the planning period used for evaluation as 20 years. The present worth values shown on p. 87 are for a period of 20 years, as are those shown for the staged interceptor alternatives. Cost-effectiveness analysis is defined as "An analysis performed to determine which waste treatment management system or component part thereof will result in the minimum total resources costs over time to meet the Federal, State or local requirements."

   It should be noted, however, that inclusion of these costs for a 20 year planning period does not represent a commitment to continue present sludge treatment and disposal for that period of time. As set forth in the draft EIS, facilities planning to be conducted by Metro will include the identification and evaluation of feasible alternatives to the present method of sludge handling. .

7. Appropriate grant conditions will be made to eliminate or reduce adverse impacts. It is our understanding that PSGC and local governments negotiated a resolution of the land use conflicts. The public has an opportunity to comment on land-use plans and to elect officials deciding land-use policies which affect growth and development.

8. Whether coliform concentrations increase or decrease will probably depend on the degree of control instituted for non-point sources which are thought to be the principal cause of poor bacterial quality in the Green River.

9. The Rention treatment plant is capable of providing adequate secondary treatment to Auburn's wastes even if BOD removal efficiencies were to decrease with the addition of substantial loadings from the Auburn area and/or the elimination of the whey waste.

10. Augmenting low river flows in the reach between Auburn and Renton with effluent does not appear to substantially improve the dissolved oxygen or temperature conditions in the river as discussed on page 129. Construction and operation of the proposed interceptor is viewed as a cost-effective solution to the sewerage needs of the area which will eliminate the discharge of inadequately treated wastes from the Auburn treatment plant.

11. The possibility of Tacoma's utilizing additional flow from the Green River is recognized. Even if low-flow augmentation were instituted, the subsequent re-allocation of water to the City of Tacoma for municipal water supply could occur. One of the alternative measures to meet water quality objectives might then have to be implemented by the Renton plant.

12. Discussion of low flow augmentation has been expanded to clarify the necessary steps before this action could be implemented. See pages 112 and E-11.

13. Note revisions on page 120. Detailed regulations to control runoff have not been made conditions of the EPA grant because such regulations are the responsibility of local authorities.

14. For the design of both systems, the size of physical components was based on the estimates of wet-weather infiltration/inflow. However, for the conditions that would create critical low flows in the Green River, it was inappropriate to use flow estimates for wet weather. Instead, values for infiltration/inflow that were thought to be more representative of the summer drier, months were used. See page 128, next to last paragraph.

15. The level of treatment provided by the Renton plant surpasses the secondary treatment requirements for removal of BOD5 and suspended solids set by EPA. A secondary treatment plant at Auburn would not, however, be required to achieve these same high levels.

16. Low flow augmentation by a modified reservoir depends on a number of factors. See revisions on pages 112 and E-11.

17. On p. 156 of the draft, relocation of alignment to avoid the wetland near South 277th Street was discussed as one method of mitigating construction impacts. Although no apparent residual effects were identified as a result of previous construction through this area, EPA will require Metro to relocate this section of the interceptor to avoid any possible impacts due to construction. This final EIS has been revised to relect this requirement.

18. It is true that historically, low flow augmentation has been required to achieve water quality adequate to permit fish passage. Considering the probability of growth in the Kent-Auburn valley the problem which you point out can perhaps be solved best by going to a METRO system with treatment at the tertiary level, or discharge to a larger receiving water body. Another possibility is for the Department of Ecology to set a base flow for the Green-Duwamish Rivers adequate to protect the anadromous fisheries of the system, coupled with a public-financed project increasing the impoundment capacity upstream from Auburn. The State of Oregon has in the past 5 years set minimum flows on many of their rivers requiring flow augmentation for protection of the anadromous fisheries. Many of these minimum flow protected rivers now have increased reservoir capacity or have it planned. Future water rights are subject to curtailment or withdrawal if low flow augmentation needs are determined by the State Water Resources Board. A similar system is now being employed on some streams in the State of Washington by the Department of Ecology. See discussions of low flow augmentation on pages 109, 129, 156, and E-11.

    If the METRO system for treatment were adopted and low flow water quality problems in the Duwamish River proved more frequent than in the years prior to employement of the METRO system, and State water quality standards were violated near and downstream from the discharge point, steps would have to be taken to achieve these standards. This would mean that (1) METRO would have to accelerate plans for incorporation of tertiary treatment adequate to solve the water quality problem, or (2) the State of Washington would have to set a base flow for the Green-Duwamish system and obtain protected impoundment capacity adequate to maintain low flow water quality within standards or (3) a cooperative effort between the Department of Ecology and METRO would be employed.

    If the METRO system were not adopted, waste treatment might be very haphazard and comparatively uncontrollable as the Kent-Auburn valley realized its full projected growth. If then a water quality problem arose, which appears likely considering the low flow volume of the river, the solution would be a Department of Ecology base flow coupled with protected increased impoundment or a cooperative effort between the Department of Ecology and a number of participants. If the Valley residents want both economic growth and a fishery, the best means of achieving it is to seek solution of waste problems through a limited few agencies, and preferably one agency.

19. See page 157. Water quality and seasonal quantity in the Green-Duwamish under any economically feasible treatment alternative which allows for full development of the Valley, could result in a decrease in the fishery. The means of the decrease would be blockage of the upstream migrants and destruction of redds and the incubating eggs. The cause would be increased residential, commercial and industrial development. The blockage would come in the lower Green River or the Duwamish River and would be due to low flow in turn causing a low dissolved oxygen and elevated temperature condition.

The impact or effect on native upstream migrating spawners would be to prevent their timely arrival at the spawning grounds. If arrival is late, water conditions may be adverse for spawning or the spawn may not be viable. The relationship between water conditions and condition of reproductive projects is a very critical one with very close tolerances.

The destruction of redds and incubating eggs would occur upstream in the spawning gravel areas of the mainstem and tributaries due to high uncontrolled flows and siltation. Hatchery fish would be protected from high flows and to some degree, siltation.

Hatchery produced fish would probably have shorter distances to travel following removal of the blockage (by a heavy Autumn rain, for example) and they could be artificially spawned shortly after arrival at the hatchery. If the blockage is long-term and prevents hatchery-bound spawners from reaching their goal, thus eliminating that years stock, eggs or fry could be taken from hatcheries of adjacent basins and incubated and reared to downstream migrant size at a Green River system hatchery. They would not be subjected during their early life history to the Summer low flow Duwamish River water quality problems that the upstream adult migrants would encounter.

The public would most likely bear the added cost of producing more hatchery fish--the route is uncertain.

WASHINGTON
Department of
FISHERIES

DANIEL J. EVANS

May 29, 1975

Mr. Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Dear Mr. Thiel:

Your Draft Environmental Impact Statement, for administrative action, on the Auburn interceptor has been reviewed. This document gives an excellent presentation of the fisheries resources of the Green River for which we have concern and responsibility. It does an excellent job of recognizing the serious potential secondary impacts of growth and development in the valley, and in discussing means for mitigating water quality degradation and related fishery losses. We would like to make a few comments for your consideration.

1. Page 26 - Uses: Recent instream uses also have included commercial fishing by Indians. It is anticipated that future management, based upon a Federal District Court decision, will continue this usage.

2. Page 51 - Fisheries: Coho spawning in the Green River and tributary streams is mentioned. Coho juveniles also rear within most areas of the watershed throughout the year. 1

3. Pages 54-55 - Fisheries: The Indian fisheries have become significant resource users in recent years, and we suggest that mention be made of this. The 1974 Indian catch from the Duwamish-Green River totaled 13,600 salmon, mostly chinook and coho. 2

4. Page 55 - Fisheries - The information requested from the Washington State Department of Fisheries will be available in our Stream Catalog which is nearing completion. 3

5. Page 150 (Table 34) - Impacts on Fisheries: The impacts of water temperature increase and dissolved oxygen decrease consider upstream blockage of migrating adult salmonids and related impacts, while the footnote addresses the impact on the salmon food organisms. These changes in water quality would also directly affect rearing for coho and chinook salmon, as well as resident species, which may suffer direct mortality if conditions become sufficiently severe. 4

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It is clear that careful planning throughout all future developments within the Green River area will be essential for protection of water quality that will enable fisheries production to be maintained at its present level. We share the concern of many agencies and individuals relative to the secondary impact resulting from expanded development. We are particularly apprehensive about the lowering of water quality in the Duwamish River where past and existing problems have occasionally been serious. The excellent consideration of mitigative measures is appreciated, and we believe it is imperative that they become an integral part of the development of the valley.

While it is true that water quality impacts on native fish could be mitigated by increased hatchery production, we believe that this should be considered only as a last resort. It is conceivable that such artificial production would have to be released elsewhere if the Duwamish-Green River habitat became sufficiently degraded. This would be undesirable to this watershed and could possibly tax the productivity of the alternate release site.

Thank you for the opportunity to review the Auburn interceptor draft statement. We hope that the comments will be helpful to you.

Sincerely,

Ray C. Johnson

Ray C. Johnson
Acting Fisheries Environmental
Coordinator

cc: E. S. Dziedzic - Dept. of Game
D. L. Lundblad - Dept. of Ecology

RESPONSE TO COMMENTS BY
STATE OF WASHINGTON DEPARTMENT OF FISHERIES

1. This information has been added to the EIS, see page 51.
2. See pages 54 and 55.
3. See page 55.
4. On p. 50, the Table has been changed to reflect this comment.

410 West Harrison Street, Seattle, Washington 98119 (206) 344-733

May 22, 1975

Mr. Richard R. Thiel, Chief
Environmental Impact Section - M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Subject: Auburn Interceptor (Green River Sewerage Area)
Draft Environmental Impact Statement

Dear Mr. Thiel:

We have reviewed the Draft Environmental Impact Statement prepared by your Agency for the Auburn Interceptor Proposal, and would like to make several comments with respect to its air quality aspects.

Existing air quality is discussed in a section beginning on page 39. This section is restricted to a discussion of suspended particulate. We should like to point out that violations of the photochemical oxidant standard have apparently occurred at the Agency station in Kent, which is the only oxidant station in the Green River Valley. Whether or not the problem exists in the Auburn area, or is related to Green River Valley Sources, or is related to controllable air pollution sources at all, is open to question. However, we believe that there is ample reason to make a further investigation of this problem, and that the Environmental Protection Agency should see that an investigation is made to determine whether strategies for oxidant control should be added to the State Air Quality Implementation plan. The Green River Valley, because of its topography, meteorology, and location with respect to the metropolitan areas, provides a classic set of conditions requisite for an oxidant problem. 1

A discussion of suspended particulate concentrations, shown by this Agency's station as exceeding regional standards, is discussed. The conclusion is drawn that there is an area background concentration of 28 micrograms per cubic meter. If "background concentration" means that concentration which would remain after all known (inventoried) sources were shut down, then the figure appears to be on the high side. The figure may be a very good current baseline reading however. There are a number of meanings which have applied to the term "background concentrations", and it would be a help if this were explained. 2

SERVING

KING COUNTY
410 West Harrison St.
Seattle, 98119
(206) 344-7330

KITSAP COUNTY
Dial Operator for Toll
Free Number Zenith 8385
Bainbridge Island,
Dial 344-7330

PIERCE COUNTY
213 Hess Building
Tacoma, 98402
(206) 383-5851

SNOHOMISH COUNTY
506 Medical-Dental Bldg.
Everett, 98201
(206) 259-0288

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MAY 27 1975

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The air quality impact section beginning on page 136 and the air quality impact analysis on Appendix B indicate that the AQDM model was used to make projections of 1990 suspended particulate concentrations, although there was no calibration of that model. We believe that it is extremely doubtful that any claim for valid results can be obtained without calibration, which is clearly required in the procedures for the use of this model as set forth in the User's Manual. Although the text of the statements says that there are only two stations for measuring suspended particulate in the service area, five high-volume air sampling stations can be spotted in the area shown on figure 14. The three additional stations are in activity zones 3840, 3820 and 3630. While five stations may not be as good as fifteen or twenty, they exceed the minimum requirements for calibration. It is true that the three additional stations are located barely outside the sewerage service area, but this sewerage service area is quite small; in fact it is an excessively small area to use as a base for projection, which is shown clearly since there was only a projection of 9.3 micrograms per cubic meter annual geometric mean for 1973 based on that area. 3

The assumption that there will be no point source increases in the area prior to 1990, which was made according to the text on page B-8, does not appear reasonable. Contrary to the text on that page, there are some large "point emitters" in the Kent area, and even though this Agency does have the authority to deny a permit to construct or establish a source that would cause a violation of an ambient air quality standard, this does not preclude a gradual growth or increase of point sources in that area. 4

The mixing depth of 940 meters which was obtained from a publication by Holzworth, and used in the modeling process, is much too high to be representative of the Valley, possibly by a factor of 2:1. 5

Minor changes are necessary as follows:

> Page 141, Table 33, Column 1 under 1973: Either change 23.9 to 23.2 or adjust the total to 62.1. 6
>
> Page B-30, next to last paragraph, the words "Figure B-5" should be changed to "Figure B-6".

Your conclusion on page B-32 that the air quality situation in the Auburn Interceptor service area is sensitive to contributions from sources outside the area, we believe to be correct. Another conclusion on that page, namely that a growth and development will result in "marginal" air quality appears to be an understatement. We agree that the AQDM, or preferably the CDM, should be calibrated and used for air quality maintenance planning as suggested on page B-32.

Thank you for the opportunity to comment on this Environmental Impact Statement.

Yours truly,

A. R. Dammkoehler
Air Pollution Control Officer

By: James R. Pearson
Senior Air Pollution Engineer

ARD:JRP:et

RESPONSE TO COMMENTS BY
PUGET SOUND AIR POLLUTION CONTROL AGENCY

1. See revisions on p. 39.
2. See revisions on p. 39.
3. See page 142.
4. See page B-8.
5. See page 138.
6. Corrections made in the text as noted.

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
412 Mohawk Building
222 S. W. Morrison St.
Portland, Oregon 97204

May 19, 1975

IN REPLY REFER TO
10ED.3

Dr. Clifford V. Smith
Regional Administrator
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101
ATTN: Mr. Walt Jasper

Re: DEIS-EPA, Auburn Interceptor
Green River Sewerage Area
King County, Washington

Dear Sir:

The Federal Highway Administration, Region 10, has reviewed the subject DEIS and wishes to make the following comment:

A brief section should be added discussing the extent of disruption during construction of the pipeline at its crossing of the major highway at S. E. 240th, S.R. 516 and S. W. 277th. 1

Sincerely yours,

Richard C. Cowdery

Richard C. Cowdery, Director
Office of Environment and Design

RESPONSE TO COMMENTS BY THE FEDERAL HIGHWAY ADMINISTRATION

1. As noted on p. 64 and p. 67 of the EIS, construction in public right-of-way is subject to permit by the appropriate agency, as well as provisions of the construction documents. Highway crossings of SR 167 at SE 240th and of SR 516 are to be jacked, augured, or bored and are covered by permits issued by the State of Washington Department of Highways. Crossings of Meeker Street in Kent and South 277th Street in King County also are to be jacked, augered, and bored. There will be no disruption during or after construction of these crossings.

   Crossings of South 285th and 286th Streets are covered by a King County permit and are to be in accordance with County standards. In addition to any other permit conditions required for street crossings in the Cities of Auburn and Kent, the specifications require that one way traffic be maintained on all streets during working hours. See response to the Washington State Highway Commission.

May 15, 1975

Richard R. Thiel, Chief
Environmental Impact Section
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Dear Mr. Thiel:

The draft environmental impact statement for the proposed Auburn Interceptor has been reviewed by my staff. We have no comments regarding this proposal.

We appreciate having an opportunity to review this statement.

Yours truly,

Bert L Cole
BERT L. COLE
Commissioner of Public Lands

BLC:wbe

MAY 16 1975

Tacoma - Pierce County Health Department

County-City Building • 930 South Tacoma Avenue
Tacoma, Washington 98402 • Telephone 593-~~4100~~ 4760

Harlan P. McNutt, M.D., M.P.H.
Director of Health

215

May 5, 1975

Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Re: Environmental Impact Statement
Auburn Interceptor
(Green River Sewerage Area)

Dear Mr. Thiel:

We have reviewed the statement.

We would encourage the full plan which would make provision for serving the North Pierce County area, if the demand arises.

Yours very truly,

R. Clifton Smith, Director
Environmental Health Division

RCS:LCS:tg

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LOCATION THURSTON AIRDUSTRIAL CENTER
PHONE 753-5755
P. O. BOX 1128
OLYMPIA, WASHINGTON 98504

April 22, 1975

IN REPLY REFER TO:

35-2650-1820
Draft EIS -
Auburn Interceptor
(Green River Sewerage
Area) - King County -
EPA Project No.
C-530475-02

Mr. Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

EIS

Dear Mr. Thiel:

The Washington State Parks and Recreation Commission has reviewed the above-noted document and does not wish to make any comment.

Thank you for the opportunity to review and comment.

Sincerely,

David W. Heiser

David W. Heiser, Chief
Environmental Coordination

David Hansen, Chief of
Archaeology and Historic
Preservation

sg

King County Department of Public Works supports proper land use planning to ensure environmentaly sound use of our land resources. We are also concerned with existing land usage which may cause environmental damage. It is our position that construction of the proposed Auburn Interceptor will solve existing pollution problems, will be compatible with existing sewer service planning and is a cost effective solution to a serious pollution problem in the Green River Basin.

Very truly yours,

J. L. DeSPAIN, P.E.
Director

JLD/VSS:mr

cc: V. Sparling

King County
State of Washington
John D. Spellman, *County Executive*

Department of Public Works
Jean L. DeSpain, *Director*
900 King County Administration Building
Seattle, Washington 98104

Rec'd 4/23/75

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EPA-515

April 22, 1975

Mr. Richard R. Thiel, Chief
Environmental Impact Section M/S 437
Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Dear Sir:

Re: Draft Environmental Impact Statement - Auburn Interceptor

We have reviewed subject document and have the following comments.

The Metro service area (King County) has received national attention for the success of its regional approach to water quality preservation. More importantly there is growing evidence of the effectiveness of that approach in restoring the water quality of our lakes and rivers. It should be remembered that even with "approved" local solutions to sewage treatment we were in serious danger of losing Lake Washington and other waterbodies from eutrophication caused by effluent discharges. Consequently the removal of the present local treatment facility at Auburn would appear to have a high potential for contributing to improve water quality in the Green River.

A decision to "do nothing" or preserve the present forms of treatment and the use of septic tanks can only result in increasing pollution in the area the Metro trunk will serve. The County is charged with monitoring the use of septic tanks in most of the service area and is well aware of the high incidence of failure and effluent leaching that has occurred as the result of the types of soil prevalent in the area. Since the absence of the proposed Metro interceptor would not guarantee that further growth would not occur the County can only conclude that increased pollutional loads will be exerted on the surface and ground waters within the service area if the Metro trunk is not constructed.

King County Department of Public Works has been a participant and review agency in comprehensive sewer planning for the entire Auburn-Black Diamond-Enumclaw area of south King County. This involvement has included the RIBCO program, Metro's Comprehensive Plan, the County's own plan for the Black Diamond area and planning by the Cities of Enumclaw and Buckley. The proposed Metro trunk is an integral part of the planned long range sewer needs of the area. We believe it to be cost effective and environmentally sound. With completion of the proposed Metro trunk the County, and other agencies in the area, can proceed to implement the local facilities needed to mitigate existing pollution problems.

WASHINGTON STATE
ADVISORY COUNCIL ON HISTORIC PRESERVATION
P. O. BOX 1128, OLYMPIA, WASHINGTON 98504

[illegible]

April 16, 1975

Mr. Roy L. Ellerman, P.E.
Chief, Water Operations Branch
Environmental Protection Agency
1200 6th Avenue
Seattle, Washington 98101

Dear Mr. Ellerman:

Thank you for your letter of April 7, 1975, providing the Environmental Protection Agency's evaluation of potential impact by the Auburn Wastewater Interceptor on known historic sites in the project area.

We would concur that the construction of the interceptor would have little direct impact on the nature of the historic properties involved. Indirect project impact is certainly more difficult to assess although we would question the reliance on local land use controls - not now in existence to the knowledge of this office - to mitigate expansion resulting from the development.

Thank you for the opportunity to consult with you.

Sincerely,

David M. Hansen, Chief
Office of Archaeology and
Historic Preservation

jac

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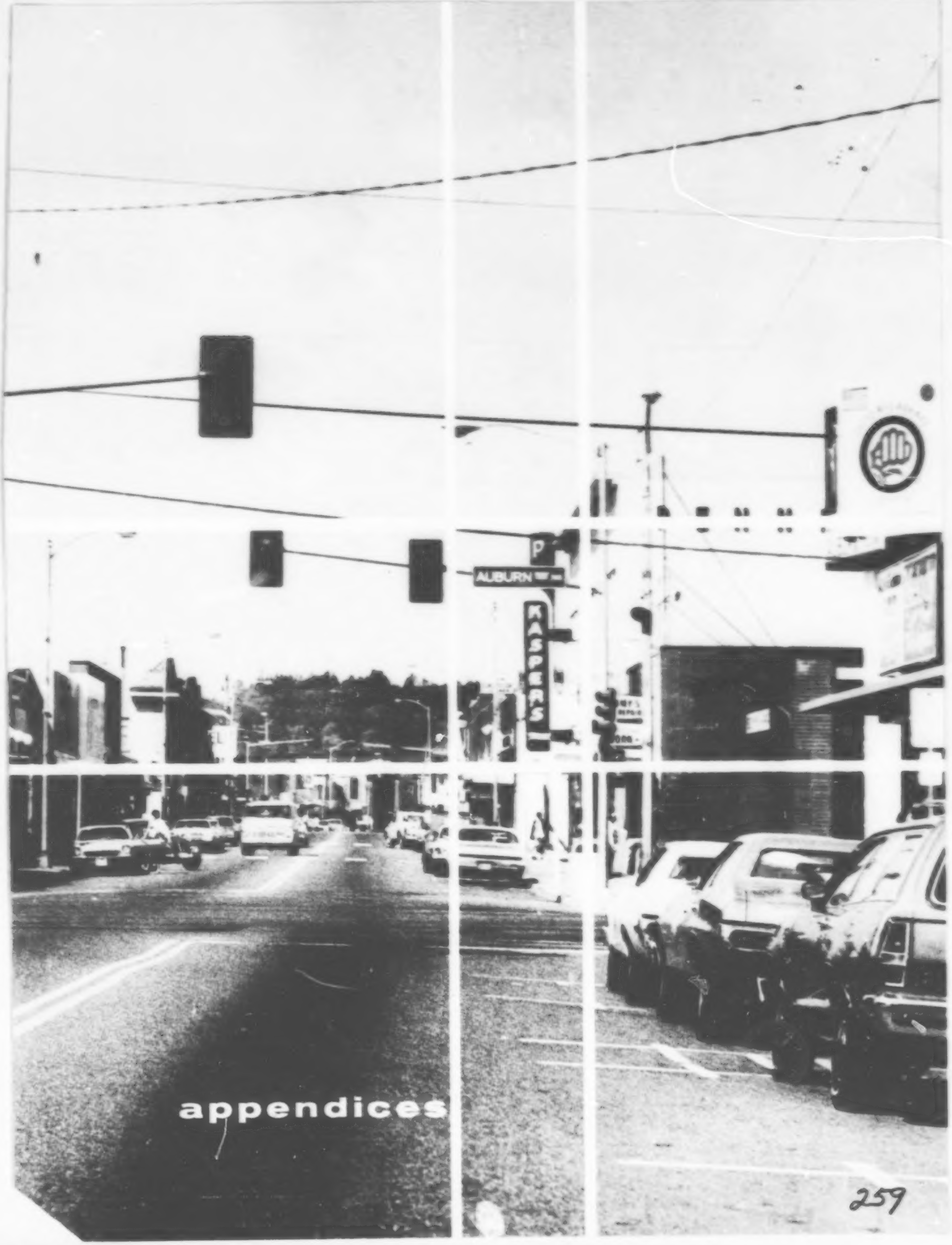
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appendices

APPENDIX A

EXCERPTS FROM

WATER QUALITY STANDARDS
OF THE
STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

The following excerpts of the State of Washington water quality standards, dated June 19, 1973, show the numerical criteria and classification which apply to the waters of the Green River Sewerage Area. Section WAC-173-201-080 is partially included. The remaining sections, through WAC 173-201-140, are not shown here.

Under the State-Federal water quality standards of June 19, 1973, the streams and lakes of the Green River Sewerage Area were classified and criteria established to protect characteristic uses.

The Green River from above Auburn to the Black River confluence is Class A. But for the Green-Duwamish upstream from the confluence of the Black River to the limit of tidal influence, a special condition allows coliform concentrations of Class B quality. Below the Black River, the Duwamish is Class B. Marine and freshwater occur in the estuary. Class B criteria for dissolved oxygen, pH, and temperature are different for marine and freshwater, but the criteria for dissolved oxygen for marine water applies when salinities exceed one part per thousand. Other criteria should be interpolated on the basis of salinity.

NEW WAC 173-201-010 PURPOSE. The purpose of this chapter is to establish water quality standards for waters of the State of Washington pursuant to the provisions of chapter 90.48 RCW and the policies and purposes thereof.

NEW WAC 173-201-020 WATER USE AND QUALITY CRITERIA. The water use and quality criteria set forth in sections 030 through 050 are established in conformance with present and potential water uses of said waters and in consideration of the natural water quality potential and limitations of the same. Nonetheless, the dynamic nature of the process is also recognized. Hence, frequent review of these uses and criteria are anticipated and revisions will be undertaken as additional information is developed.

NEW WAC 173-201-030 -------GENERAL WATER USE AND CRITERIA CLASSES. The following criteria shall be applicable to the various classes of waters in the State of Washington:

(1) Class AA (Extraordinary).

(a) General characteristic. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but are not limited to the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Wildlife habitat, stock watering.

(iii) General recreation and aesthetic enjoyment (picnicking, hiking, fishing, swimming, skiing, and boating).

(iv) General marine recreation and navigation.

(v) Fish and shellfish reproduction, rearing, and harvest.

(c) Water quality criteria.

(i) Total coliform organisms shall not exceed median values of 50 (fresh water) or 70 (marine water) with less than 10% of samples exceeding 230 when associated with any fecal source.

(ii) Dissolved oxygen shall exceed 9.5 mg/l (fresh water) or 7.0 mg/l (marine water).

(iii) Total dissolved gas - the concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.

(iv) Temperature - water temperatures shall not exceed 60° F. (fresh water) or 55° F. (marine water) due in part to measurable (0.5° F.) increases resulting from human activities; nor shall such temperature increases, at any time, exceed $t = 75/(T-22)$ (fresh water) or $t = 24/(T-39)$ (marine water); for purposes hereof "t" represents the permissive increase and "T" represents the water temperature due to all causes combined.

(v) pH shall be within the range of 6.5 to 8.5 (fresh water) or 7.0 to 8.5 (marine water) with an induced variation of less than 0.1 units.

(vi) Turbidity shall not exceed 5 JTU over natural conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be less than those which may affect public health, the natural aquatic environment, or the desirability of the water for any usage.

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch or taste.

(2) Class A (Excellent).

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but are not limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Wildlife habitat, stock watering.

(iii) General recreation and aesthetic enjoyment (picnicking, hiking, fishing, swimming, skiing and boating).

(iv) Commerce and navigation.

(v) Fish and shellfish reproduction, rearing and harvest.

(c) Water quality criteria.

(i) Total coliform organisms shall not exceed median value of 240 (fresh water) with less than 20% of samples exceeding 1,000 when associated with any fecal sources or 70 (marine water) with less than 10% of samples exceeding 230 when associated with any fecal sources.

(ii) Dissolved oxygen shall exceed 8.0 mg/l (fresh water) or 6.0 mg/l (marine water).

(iii) Total dissolved gas - the concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.

(iv) Temperature - water temperatures shall not exceed 65° F. (fresh water) or 61° F. (marine water) due in part to measurable (0.5° F.) increases resulting from human activities; nor shall such temperature increases, at any time, exceed $t = 90/(T-19)$ (fresh water) or $t = 40/(T-35)$ (marine water); for purposes hereof "t" represents the permissive increase and "T" represents the water temperature due to all causes combined.

(v) pH shall be within the range of 6.5 to 8.5 (fresh water) or 7.0 to 8.5 (marine water) with an induced variation of less than 0.25 units.

(vi) Turbidity shall not exceed 5 JTU over natural conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those of public health significance, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect any water use.

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) Class B (Good)

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic uses. Characteristic uses shall include, but are not limited to, the following:

(i) Industrial and agricultural water supply.

(ii) Fishery and wildlife habitat.

(iii) General recreation and aesthetic enjoyment (picnicking, hiking, fishing, and boating).

(iv) Stock watering.

(v) Commerce and navigation.

(vi) Shellfish reproduction and rearing, and crustacea (crabs, shrimp, etc.) harvest.

(c) Water quality criteria.

(i) Total coliform organisms shall not exceed median values of 1,000 with less than 10% of samples exceeding 2,400 when associated with any fecal source.

(ii) Dissolved oxygen shall exceed 6.5 mg/l (fresh water) or 5.0 mg/l (marine water), or 70% saturation, whichever is greater.

(iii) Total dissolved gas - the concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.

(iv) Temperature - water temperatures shall not exceed 70° F. (fresh water) or 66° F. (marine water) due in part to measurable (0.5° F.) increases resulting from human activities; nor shall such temperature increases, at any time, exceed t = 110/(T-15) (fresh water) or t = 52/(T-32) (marine water); for purposes hereof "t" represents the permissive increase and "T" represents the water temperature due to all causes combined.

(v) pH shall be within the range of 6.5 to 8.5 (fresh water) or 7.0 to 8.5 (marine water) with an induced variation of less than 0.5 units.

(vi) Turbidity shall not exceed 10 JTU over natural conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which adversely affect public health during the exercise of characteristic usages, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect characteristic water uses.

(viii) Aesthetic values shall not be reduced by dissolved, suspended, floating or submerged matter not attributable to natural causes, so as to affect water usage or taint the flesh of edible species.

(4) Class C (Fair):

(a) General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.

(b) Characteristic uses. Characteristic uses shall include, but are not limited to, the following:

(i) Cooling water.

(ii) Commerce and navigation.

(iii) Fish passage.

(iv) Boating.

(c) Water quality criteria.

(i) Total coliform organisms shall not exceed median values of 1,000 when associated with any fecal source.

(ii) Dissolved oxygen shall exceed 5.0 mg/l (fresh water) or 4.0 mg/l (marine water), or 50% saturation, whichever is greater.

(iii) Total dissolved gas - the concentration of total dissolved gas shall not exceed 110% saturation at any point of sample collection.

(iv) Temperature - water temperatures shall not exceed 75° F. (fresh water) or 72° F. (marine water) due in part to measurable (0.5° F.) increases resulting from human activities; nor shall such temperature increases, at any time, exceed t = 125/(T-12) (fresh water) or t = 64/(T-29) (marine water); for purposes hereof "t" represents the permissive increase and "T" represents the water temperatures due to all causes combined.

(v) pH shall be within the range of 6.5 to 9.0 (fresh water) or 7.0 to 9.0 (marine water) with an induced variation of less than 0.5 units.

(vi) Turbidity shall not exceed 10 JTU over natural conditions.

(vii) Toxic, radioactive or deleterious material concentrations shall be below those which adversely affect public health during the exercise of characteristic usages, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect characteristic water uses.

(viii) Aesthetic values shall not be interfered with by the presence of obnoxious wastes, slimes, or aquatic growths or by materials which will taint the flesh of edible species

(5) Lake Class.

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses for waters of this class shall include, but are not limited to, the following:

(i) Water supply (domestic, industrial, agricultural)

(ii) Wildlife habitat, stock watering.

(iii) General recreation and aesthetic enjoyment (picnicking, hiking, fishing, swimming, skiing, and boating).

(iv) Fish and shellfish reproduction, rearing, and harvest.

(c) Water quality criteria.

(i) Total coliform organisms shall not exceed median values of 240 with less than 20% of samples exceeding 1,000 when associated with any fecal source.

(ii) Dissolved oxygen - no measurable decrease from natural conditions.

(iii) Total dissolved gas - the concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.

(iv) Temperature - no measurable change from natural conditions.

(v) pH - no measurable change from natural conditions.

(vi) Turbidity shall not exceed 5 JTU over natural conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be less than those which may affect public health, the natural aquatic environment, or the desirability of the water for any usage.

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

NEW WAC 173-201-040 -------GENERAL CONSIDERATIONS. The following general guidelines shall be applicable to the water quality criteria and classifications set forth in WAC 173-201-020 through WAC 173-201-080 hereof:

(1) At the boundary between waters of different classifications, the water quality criteria for the higher classification shall prevail.

(2) In brackish waters of estuaries, where the fresh and marine water quality criteria differ within the same classification, the criteria shall be interpolated on the basis of salinity except that the marine water quality criteria shall apply for dissolved oxygen when the salinity is one (1) part per thousand or greater and for total coliform organisms when the salinity is ten (10) parts per thousand or greater.

(3) Except for the aesthetic values and acute biological shock conditions the water quality criteria herein established shall not apply:

(a) Within immediate mixing zones of a very limited size adjacent to or surrounding a wastewater discharge;

(b) In the case of total dissolved gas, when the stream flow exceeds the 10-year, 7-day average flood;

(c) In a manner contrary to the applicable conditions of a valid discharge permit.

(4) The total area and/or volume of a receiving water assigned to a mixing zone shall be as described in a valid discharge permit and limited to that which will: (a) not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem; (b) not diminish other beneficial uses disproportionately.

(5) The criteria established in WAC 173-201-030 through WAC 173-201-050 for any of the various classifications of this regulation may be modified by the director for limited periods when receiving waters fall below their assigned water quality criteria due to natural causes or if in the opinion of the director the protection of the overall public interest and welfare requires such modification.

(6) Except where the director determines that overriding considerations of the public interest will be served, wherever receiving waters of a classified area are of a higher quality than the criteria assigned for said area, the existing water quality shall constitute water quality criteria.

(7) Whenever the natural conditions are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

(8) Due consideration will be given to the precision and accuracy of the sampling and analytical methods used in the application of the criteria.

(9) The analytical testing methods for these criteria shall be in accordance with the most recent editions of Standard Methods for the Examination of Water and Waste Water, and Methods for Chemical Analysis of Water and Wastes (EPA 16020), and other or superceding methods published or approved by the department following consultation with adjacent states and concurrence of the Environmental Protection Agency.

(10) Deleterious concentrations of radioactive materials for all classes shall be as determined by the lowest practicable concentration attainable and in no case exceed: (a) 1/3 of the values listed in WAC 402-24-220 (Column 2, Table II, Appendix A, Rules and Regulations for Radiation Protection), or (b) the 1962 U.S. Public Health Service Drinking Water Standards as revised, or (c) the Radiation Protection Guides for maximum exposure of critical human organs recommended by the former Federal Radiation Council in the case of foodstuffs harvested from waters for human consumption.

(11) Deleterious concentrations of toxic, or other non-radioactive materials shall be as determined by the department in consideration of the Report of the National Technical Advisory Committee on Water Quality Criteria, 1968, and as revised, and/or other relevant information.

NEW WAC 173-201-050 -------CHARACTERISTIC USES TO BE PROTECTED. The following is a noninclusive list of uses to be protected by the various classifications in fresh and marine waters:

USES	WATERCOURSE CLASSIFICATION				
	LAKE	AA	A	B	C
FISHERIES					
Salmonid					
Migration	F	F M	F M	F M	F M
Rearing	F	F M	F M	F M	
Spawning	F	F	F		
Warm Water Game Fish					
Rearing	F	F	F	F	
Spawning	F	F	F	F	
Other Food Fish	F	F M	F M	F M	
Commercial Fishing	F	F M	F M	F M	
Shellfish	F	M	M	M	
WILDLIFE	F	F M	F M	F M	
RECREATION					
Water Contact	F	F M	F M		
Boating and Fishing	F	F M	F M	F M	F M
Environmental Aesthetics	F	F M	F M	F M	F M
WATER SUPPLY					
Domestic	F	F	F		
Industrial	F	F M	F M	F M	F M
Agricultural	F	F	F	F	F
NAVIGATION	F	F M	F M	F M	F M
LOG STORAGE & RAFTING	F	F M	F M	F M	F M
HYDRO-POWER	F	F	F	F	F

NEW WAC 173-201-060 WATER COURSE CLASSIFICATION. The various waters of the State of Washington are classified as follows, except as noted herein:

NEW WAC 173-201-070 -------GENERAL CLASSIFICATIONS. (1) All surface waters lying within the mountainous regions of the state assigned to national parks, national forests, and/or wilderness areas, are hereby designated Class AA or Lake Class.

(2) All lakes and their feeder streams within the state are hereby designated Lake Class and Class AA respectively.

(3) All reservoirs with a mean detention time of greater than 15 days are classified Lake Class.

(4) All reservoirs with a mean detention time of 15 days or less are classified the same as the river section in which they are located.

(5) All reservoirs established on preexisting lakes are classified as Lake Class.

(6) All other waters within the state are hereby designated Class A.

NEW WAC 173-201-080 -------SPECIFIC CLASSIFICATIONS. Various specific waters of the State of Washington are classified as follows:

Coulee Dam (river mile 595). Special condition from Washington-Oregon border (river mile 309) to Priest Rapids Dam (river mile 397). Temperature - water temperatures shall not exceed 68° F. due in part to measurable (0.5° F.) increases resulting from human activities; nor shall such temperature increases, at any time, exceed t = 110/(T-15); for purposes hereof, "t" represents the permissive increase and "T" represents the water temperature due to all causes combined.

(25) Columbia River from Grand Coulee Dam (river mile 595) to Canadian border (river mile 742). Class AA

(26) Colville River. Class A

(27) Commencement Bay from south and east of a line bearing 258° true from "Brown's Point" and north and west of a line bearing 225° true through the Hylebos Waterway light. Special condition - total coliform organisms shall not exceed median values of 1,000 with less than 20% of samples exceeding 2,400 when associated with any fecal source. Class A

(28) Commencement Bay inner, from south and east of a line bearing 225° true through the Hylebos Waterway light except the city waterway south and east of south 11th street. Class B

(29) Commencement Bay, city waterway south and east of south 11th street. Class C

(30) Coweeman River from mouth to Mulholland Creek. Class A

(31) Coweeman River from Mulholland Creek to headwaters. Class AA

(32) Crab Creek and tributary streams from confluence with Columbia River to headwaters. Class B

(33) Decker Creek from mouth to headwaters. Class AA

(34) Deschutes River from mouth to headwaters. Class A

(35) Dickey River. Class A

(36) Dosewallips River and tributaries. Class AA

(37) Drayton Harbor, south of entrance. Class A

(38) Duckabush River and tributaries. Class AA

(39) Dungeness River from mouth to Canyon Creek. Class A

(40) Dungeness River and tributaries from Canyon Creek to headwaters. Class AA

(41) Duwamish River from mouth south of a line bearing 254° true from the NW corner of berth 3, terminal no. 37 to the confluence with the Black River (Tukwila). Class B

(42) Duwamish River upstream from the confluence with the Black River to the limit of tidal influence. Special condition - total coliform organisms shall not exceed median values of 1,000 with less than 20% of samples exceeding 2,400 when associated with any fecal source. Class A

(43) Dyes and Sinclair Inlets west of longitude 122°37' W. Special conditions - Sinclair Inlet and Port Washington Narrows West of longitude 122°37' W. and south of latitude 47°35'20" N. Total coliform organisms - shall not exceed median values of 1,000 with less Class A

(61) Hoquiam River from mouth to river mile 9.	Class B
(62) Issaquah Creek from mouth to headwaters.	Class A
(63) Kalama River from lower Kalama River Falls to headwaters.	Class AA
(64) Klickitat River from Little Klickitat River to headwaters.	Class AA
(65) Lake Washington Ship Canal from Lake Washington to Government Locks. Special condition - salinity shall not exceed one part per thousand (1.0 ppt) at any point or depth along a line that transects the ship canal at the University Bridge.	Lake Class
(66) Lewis River east fork, from Multon Falls to headwaters.	Class AA
(67) Little Wenatchee River from Lake Wenatchee to headwaters.	Class AA
(68) Methow River from Okanogan National Forest boundary to headwaters.	Class AA
(69) Mill Creek from confluence with Walla Walla River to 13th street bridge in Walla Walla. Special condition - dissolved oxygen concentration shall exceed 5.0 mg/l or 50% saturation whichever is greater.	Class B
(70) Mill Creek from City of Walla Walla waterworks dam to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(71) Naches River from Snoqualmie National Forest boundary to headwaters.	Class AA
(72) Naselle River from Naselle Falls to headwaters.	Class AA
(73) Newaukum River from mouth to headwaters.	Class A
(74) Nisqually River from Alder Dam to headwaters.	Class AA
(75) Nooksack River from mouth to river mile 4 (just below Ferndale). Special condition - total coliform organisms - shall not exceed a median value of 240 with less than 20% of samples exceeding 1,000 when associated with any fecal source.	Class A
(76) Nooksack River from confluence with Maple Creek to headwaters.	Class AA
(77) Nooksack River, south fork, from Skookum Creek to headwaters.	Class AA
(78) Nooksack River, middle fork.	Class AA
(79) Oakland Bay west of longitude 123° 05' W. (inner Shelton harbor).	Class B
(80) Okanogan River from mouth to Oroville (river mile 80, confluence with Similkameen River).	Class B
(81) Palouse River from mouth to Colfax (river mile 88, confluence with south fork).	Class B
(82) Palouse River from Colfax (river mile 88, confluence with south fork) to Idaho border (river mile 110). Special condition - Temperature - water temperatures shall not exceed 68° F. due in part to measurable (0.5° F.) increases resulting from human activities; nor shall such temperature increases, at any time, exceed t = 110/(T-15); for purposes hereof, "t"	Class A

APPENDIX B

AUBURN INTERCEPTOR SERVICE AREA
AIR QUALITY IMPACT ANALYSIS

Prepared for:
Environmental Protection Agency Region X
1200 Sixth Avenue
Seattle, Washington 98101

by

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North Carolina 27711

March 1975

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I. INTRODUCTION

1.1 BACKGROUND

The construction of the Auburn Interceptor represents implementation of a proposed element of Municipality of Metropolitan Seattle (Metro) Comprehensive Plan and is a portion of the second phase of the ultimate development of an areawide waste water treatment system serving the total sewerage needs of the Green River Sewerage Area and a portion of the White River Watershed.

The proposed Interceptor will be a 42- to 72-inch reinforced concrete pipe totaling 7.1 miles in length. The pipe will commence at the influent structure of the existing City of Auburn sewage lagoon and connect with the existing Metro-Kent Cross Valley Interceptor.

The sewerage area to be served by the Interceptor encompasses the Green River Sewerage Area and a portion of the White River Watershed. Included within this area is all of the Lower Green River Valley in the vicinity of the cities of Kent, Auburn, Algona and Pacific, and Des Moines Plateau (West Hill) to the west. The area to be served by the Interceptor in the White River Watershed lies north of Lake Tapps and within both King and Pierce Counties.

Upland plateaus incised by the valley trough and flood plain of the Green River are the principal topographic features of the sewerage area. The ascent to the upland areas is abrupt with differences in elevation between the river bottom and the plateau in excess of 300 feet. The uplands present a rolling glacial relief characterized by depressions and hummocks in which stream courses and drainage patterns are often poorly defined. Numerous local basins and depressions of retarded drainage are occupied by small lakes and swampy areas and bogs. The Green River is artificially controlled by an upstream dam and man-made levees, that parallel the stream throughout most of its length within the sewerage area.

In addition to its diverse topography, the sewerage area is characterized by a variety of land uses: agriculture and sharply contrasting industrial development in the Green River Valley, with retail, commercial and residential uses in the cities and towns; and forestry, mining, open space, recreation, and scattered rural residential and farming uses on the eastern uplands. Recent photogrammetric interpretations of the sewerage area reveal the following land use allocations: woodland, 37,700 acres (40 percent); suburban land, including low-density residential, recreational-home, and neighborhood commercial areas, 15,780 acres (17 percent); agricultural land, 9,030 acres (10 percent); open and vacant land, 8,720 acres, (9 percent); high-density residential and commercial areas, 6,300 acres (7 percent); transportation corridors including railroad yards and freeways, 5,890 acres (6 percent); transmission line utility corridors, 4,140 acres (4 percent); industrial areas, 1,140 acres (1 percent); and recreational areas, 410 acres (.1 percent). The acreage designated as commercial probably includes some light industrial and warehousing establishments.

The Green River Valley Area and the Auburn Interceptor Service Area (AISA) are shown in Figure B-1.

1.2 BASIC ASSUMPTIONS

Two fundamental policy decisions were made at the outset of the analysis in order to reduce the magnitude of the task to manageable proportions. First, the year 1990 was selected as the target year for the analysis, even though the interceptor was sized according to a projection to the year 2000. This was done since it is not possible to project the nature of efficiency of air pollution control technology twenty-five years in advance; even a projection to 1990 is fraught with uncertainty. The same may be said about land use, population, and motor vehicle travel projections as well. While errors in sewage capacity projections can be compensated for through a variety of means such as the construction of additional treatment facilities, or the under-utilization of installed capacity, the overall precision of the air quality analysis is crucial since the projected air quality is related to a fixed, finite air quality standard. Therefore, it

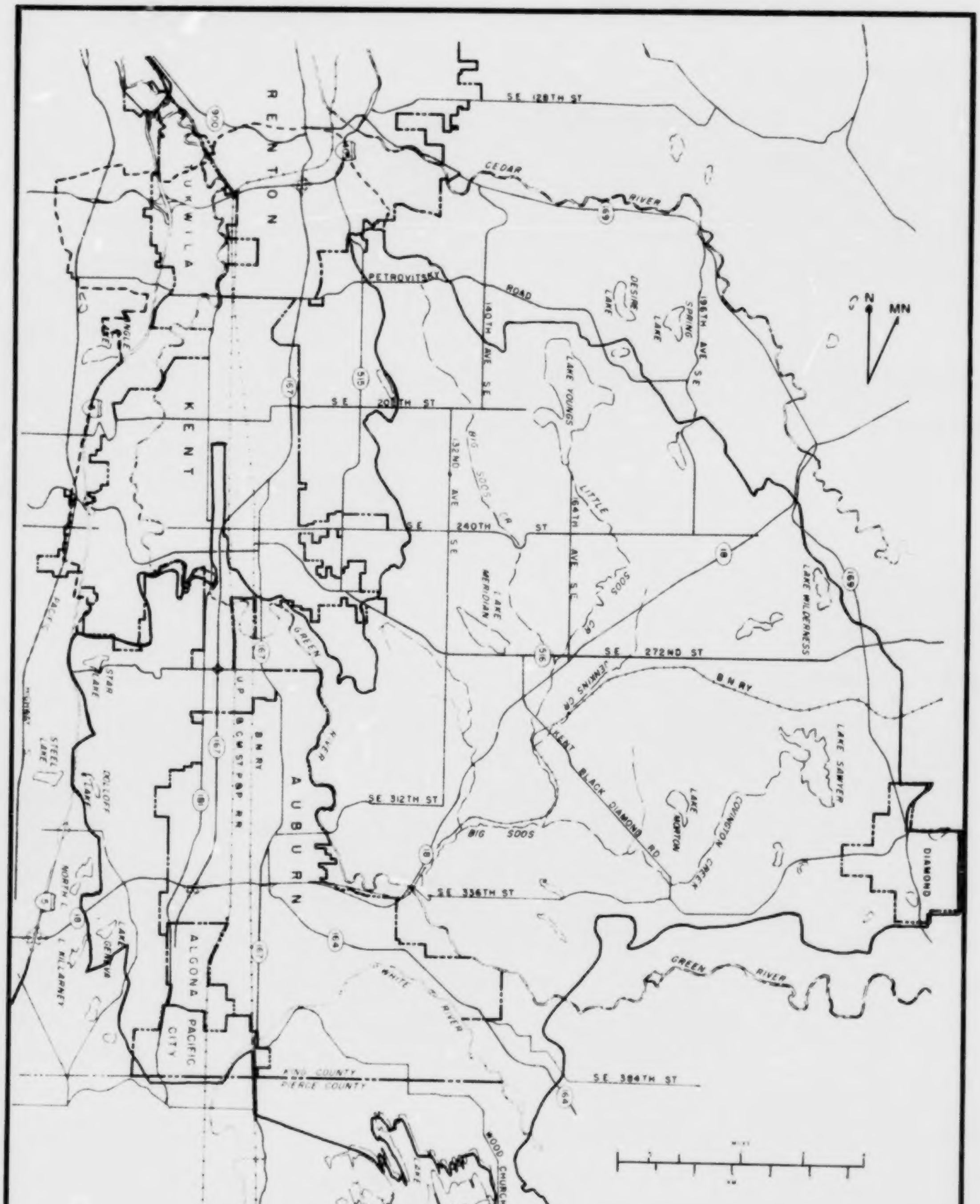
RENTON
TUKWILA
KENT
AUBURN
ALGONA
PACIFIC CITY
DIAMOND
SE 128TH ST
CEDAR RIVER
PETROVITSKY ROAD
140TH AVE SE
196TH AVE SE
SPRING LAKE
DESIRE LAKE
LAKE YOUNGS
SE 208TH ST
132ND AVE SE
BIG SOOS CR
LITTLE SOOS CR
164TH AVE SE
SE 240TH ST
LAKE MERIDIAN
LAKE WILDERNESS
SE 272ND ST
JENKINS CR
BN RY
LAKE SAWYER
KENT BLACK DIAMOND RD
LAKE MORTON
COVINGTON CREEK
SE 312TH ST
BIG SOOS
SE 336TH ST
GREEN RIVER
WHITE RIVER
SE 384TH ST
KING COUNTY
PIERCE COUNTY
OLD CHURCH RD
LAKE TAPPS
STAR LAKE
STEEL LAKE
DOLLOFF LAKE
NORTH L
LAKE GENEVA
L KILLARNEY
ANGLE LAKE
U.P.
C M ST P&P RR
N
MN
900
169
515
167
18
516
161
164
5
Auburn Interceptor Service Area
Green Valley Sewerage Area

Figure B-1. Auburn Interceptor Service Area was not considered meaningful to attempt to project air quality in the year 2000. In addition, the Puget Sound Governmental Conference (PSGC) has made its most detailed projections of population, employment, and motor vehicle activity up to the year 1990. If this resource was to be utilized at all, 1990 would have to be the target year.

The second decision was that sources large enough to be considered point sources would not be projected. Data currently available from the PSGC do not permit projecting the type and size of point sources that may locate in the AISA. Additionally, control technology that would be used by the industry that would locate in the area cannot be identified at this time.

Existing point sources in the service area as well as other areas were included in the emission inventory used in this air quality study. However, without any definitive information on the expected emission growth or emission configuration the same emissions were used both in the 1973 and 1990 projections of air quality. As can be seen in the results sections (Figure B-5 and page B-1-20), the large point emitters in the Kent and Renton areas do not significantly affect air quality within the service area. In addition, as can be seen on page B-1-20, the point sources within the Auburn area contribute collectively less than 2% to the TSP levels within and outside of the service area. Therefore the assumption of not projecting growth of point sources, while not completely realistic, will not significantly affect the results since even a twofold increase in emissions from those sources within the service area would contribute less than 4% to the overall TSP levels. However, should any major point source locate in the AISA, it will be subject to new source review procedures under PSAPCA Regulation I.

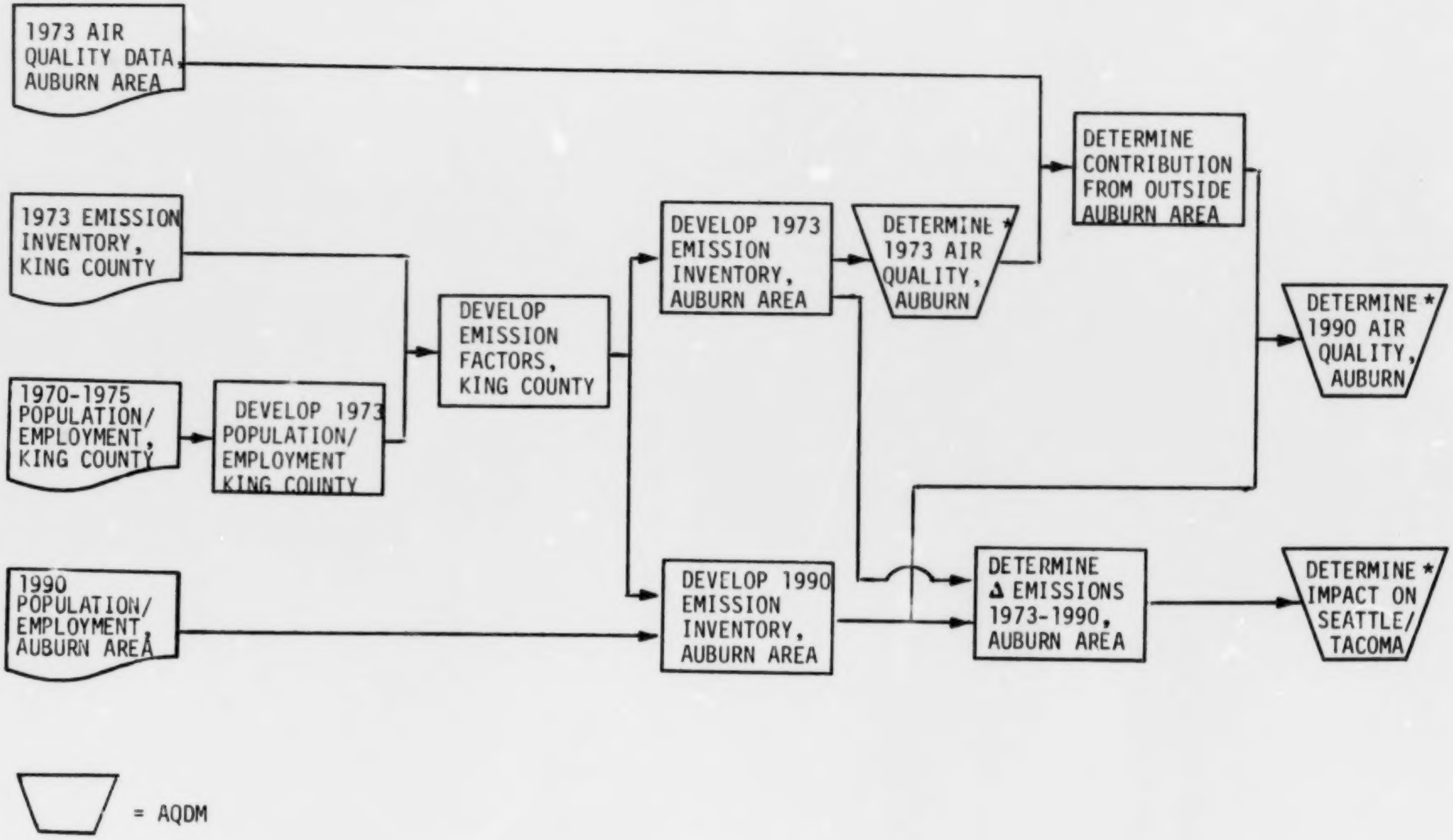
1973 AIR QUALITY DATA, AUBURN AREA
1973 EMISSION INVENTORY, KING COUNTY
1970-1975 POPULATION/ EMPLOYMENT, KING COUNTY
1990 POPULATION/ EMPLOYMENT, AUBURN AREA
DEVELOP 1973 POPULATION/ EMPLOYMENT KING COUNTY
DEVELOP EMISSION FACTORS, KING COUNTY
DEVELOP 1973 EMISSION INVENTORY, AUBURN AREA
DEVELOP 1990 EMISSION INVENTORY, AUBURN AREA
DETERMINE * 1973 AIR QUALITY, AUBURN
DETERMINE CONTRIBUTION FROM OUTSIDE AUBURN AREA
DETERMINE Δ EMISSIONS 1973-1990, AUBURN AREA
DETERMINE * 1990 AIR QUALITY, AUBURN
DETERMINE * IMPACT ON SEATTLE/ TACOMA
= AQDM

Fig.B-2. Air Quality Analysis Procedures.

* Projections are made using an uncalibrated AQDM. While the use of a calibrated AQDM is desirable, requisite air quality data for calibration are not available for the area under analysis.

Under these programs any proposed source anticipated to cause a violation of an existing air quality standard may be denied a permit to construct.[2] Thus, the emission projection and subsequent air quality analysis are concerned with the impact of increased emissions due to area sources of particulate matter. These sources include residential, commercial, and small industrial space heating units; motor vehicle particulate emissions; railroad emissions; fugitive dust (due to travel on dirt roads, construction activity, and structural fires); incineration; open burning; and off-highway vehicle emissions.

1.3 METHODOLOGY

An overview of the methodology used in projecting the impact of growth and development in the AISA on air quality is shown in Figure B-2. Development of the 1973 and 1990 point source emission inventories is Section 3, and the determination of impact of growth and development on air quality in Section 4. Conclusions and recommendations are presented in Section 5.

The analysis described here is the projection of the probable air quality impact due to growth and urbanization in the proposed service area of the Auburn Interceptor. Air quality impacts are determined for the service area, and the Tacoma and Seattle areas.

2. POINT SOURCE EMISSION INVENTORY

2.1 1973 INVENTORY

King County 1973 emission inventories provided by Region X, Environmental Protection Agency, and PSAPCA were used as the basis for developing the 1973 emission inventory for the AISA. These inventories represent up-dated PSAPCA inventories and are considered to be the most current information available.

The point source emission inventory for the AISA includes all point sources located within the Green River Valley Sewerage area. Some of these sources, those in the Renton area, are outside of the area to be served by the new interceptor. They, however, are located in the Green Valley Sewerage Area and may make a significant contribution to the ambient particulate concentration in the Auburn area.

Point sources within the area under analyses were identified by plotting the interceptor area boundaries on a U.S. Geological Survey Map, scale 1: 24,000, and locating the sources by their UTM coordinates. Other data required for AQDM (stack parameters and 1973 emissions) were extracted from the PSAPCA-King County inventory provided by Region X. The emission inventory developed by this procedure is summarized in Table B-1.

2.2 1990 INVENTORY

As stated in Section 1.2, a basic assumption underlying this analysis is that point sources would not be projected to 1990. Therefore, the 1973 point source inventory is used for making 1990 air quality projections. It is not anticipated that major emitters will be located in the AISA. Air quality impact of those that do will be evaluated through new source review procedures required by PSAPCA Regulation I.

TABLE B-1. POINT SOURCE INVENTORY, AUBURN INTERCEPTOR SERVICE AREA

SOURCE NUMBER	NAME	LOCATION			EMISSIONS tons/yr.	STACK DATA*			
		City	UTM Easting	UTM Northing		Height m	Diameter m	Velocity m	Temperature °K
1	Boeing	Auburn	558.0	5238.0	10.5	13.1	0.9	68.9	422.
2	Northwest Steel Rolling Mills	Kent	558.4	5250.3	92.8	12.2	1.4	35.9	464.
3	Washington Asphalt No. 34	Kent	564.4	5242.1	116.2	6.1	1.2	19.8	355.
4	Boeing	Kent	570.0	5249.0	4.0	14.0	1.2	n.a.	505.
5	National Can Corp.	Kent	557.9	5249.3	1.0	9.1	0.5	9.4	422.
6	Associated Sand and Gravel #9	Tukwila	555.7	5253.7	21.8	12.2	3.0	25.5	422.
7	Associated Sand and Gravel #10	Auburn	560.4	5236.8	4.2	6.1	0.5	10.9	422.
8	Associated Sand and Gravel #11	Auburn	553.0	5247.5	1.3	7.6	1.5	9.4	394.
9	Howard Manufacturing Co.	Kent	557.5	5248.2	8.1	18.3	0.9	n.a.	422.
10	Container Corp.	Renton	557.0	5258.0	0.7	15.2	0.6	2.4	422.
11	General Services Administration	Auburn	558.5	5238.5	1.6	15.2	0.9	4.8	422.
12	Sternoff Metals	Renton	557.6	5254.5	65.1	n.a.	n.a.	n.a.	284.
13	Segale, M.A.	Kent	556.0	5254.0	84.0	n.a.	n.a.	n.a.	284.
14	Interpace Corp.	Renton	560.6	5258.5	7.9	n.a.	n.a.	n.a.	284.
15	Black River Quarry	Seattle	556.5	5258.3	191.0	n.a.	n.a.	n.a.	284.
16	Auburn Packing	Auburn	562.4	5238.5	2.0	n.a.	n.a.	n.a.	339.
17	Fiorito Bros. Inc.	Auburn	555.7	5234.7	20.0	n.a.	n.a.	n.a.	n.a.
18	Burlington N.R.R. Switchyard	Auburn	557.5	5237.5	3.3	n.a.	n.a.	n.a.	n.a.
19	Segale, M.A.	Auburn	560.5	5235.4	9.0	n.a.	n.a.	n.a.	n.a.
20	Miles Sand and Gravel Co.	Auburn	559.6	5238.3	14.8	n.a.	n.a.	n.a.	n.a.

*n.a.= Stack data not available

3. AREA SOURCE EMISSION INVENTORY

Area source emission inventories for 1973 and 1990 were developed by the Planning Environment International Division of Alan M. Voorhees & Assoc. Inc., (AMV) under subcontract to RTI.

King County area emission inventory and PSGC indexes for activity allocation data were used to allocate area emissions to sub areas within the AISA. The following steps were involved:

- Select the index most appropriate for each emission source category.
- Calculate baseyear emission factors from index totals for King County.
- Allocate 1973 emissions on the basis of PSGC index allocations for the zones within the sewerage area.
- Calculate emission factor reductions due to implementation of known control regulations by 1990 (open burning and residential incineration prohibited, and catalytic converters used on all automobiles).
- Compute 1990 emission factors.
- Compute 1990 zonal emissions on the basis of PSGC projected index allocations.

Detailed procedures used in the development of area source emission inventories shown in Table B-2 are given in Appendix C.

TABLE B-2. AREA SOURCE EMISSION INVENTORY, 1973 and 1990

AAM[1] Zone	UTM Coordinates[2] X	UTM Coordinates[2] Y	Service Land Area (acres)	1973 Emissions (tons/year)	1990 Emissions (tons/year)
1320	563.5	5,232.8	4,689	27.46	35.11
3020	555.2	5,236.8	2,747	39.25	47.73
3040	555.4	5,241.4	2,254	33.35	40.05
3050	555.7	5,244.8	3,407	42.04	45.69
3100	557.9	5,236.5	3,993	177.01[3]	274.58[3]
3110	561.9	5,235.1	3,042	22.15	32.52
3120	565.8	5,238.6	15,832	108.49	110.59
3130	561.5	5,237.7	1,964	25.57	27.06
3140	558.4	5,242.0	4,730	118.18[3]	132.82[3]
3150	561.9	5,243.6	2,700	36.43	43.90
3220	570.9	5,240.6	12,017	67.61	71.09
3300	570.2	5,245.7	8,516	49.29	44.45
3400	558.4	5,245.5	2,075	55.46[3]	74.51[3]
3410	562.0	5,246.9	1,079	21.38	26.28
3420	565.6	5,246.1	5,730	48.89	57.83
3430	566.4	5,251.1	7,455	59.22	66.82
3440	561.4	5,249.9	1,292	20.86	26.71
3450	557.4	5,249.1	327	29.96	33.89
3460	562.8	5,253.1	2,138	41.20	51.03
3830	562.0	5,255.3	554	7.27	7.50
Total			86,541	1,031.07	1,250.16

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[1] Activity allocation model sub areas within King County designated by PSGC.

[2] Centroid location of the AAM zone.

[3] Includes contribution due to railroad activity.

4. AIR QUALITY MODELING

4.1 AQDM

The Air Quality Display Model[3] (AQDM) is a computer program designed to estimate the spatial distribution of particulate and sulfur dioxide concentrations.

Procedurally, the model is calibrated for each geographic region being studied. In order to calibrate the model, a base year is selected for which the following data are available:

a. Air quality data from several representative sampling stations.

b. Meteorological data including average annual temperature, pressure, mixing depth, and wind roses (frequencies by direction and speed classes) for five atmospheric stability categories ranging from extremely unstable to extremely stable for a weather station representative of the wind conditions in the study area.

c. Annual emissions, in tons, from both point and area sources, and

d. Background pollutant concentrations (optionally included).

These data are seldom adequate and available and, therefore, subjective compromises must be made. Conceptually and ideally a statistically significant least squares regression fit can be made to a plot of the concentrations mathematically estimated at each air quality monitoring site as compared to the observed concentrations; this then becomes the linear equation used to adjust the model's calculated concentrations when emissions are estimated to change (because of area growth, control strategies, etc.).

Existing air quality data within the AISA precluded the use of a calibrated dispersion model. While valid air quality data for at least three monitoring sites constitute the theoretical minimum air quality data necessary for calibration, experience has shown that valid data from 15 to 20 sites are normally required. Such data for 1973 (year for which baseline emission data are available) exist for only two monitoring sites within the interceptor service area[4]--site 490100003I01, located in Auburn, and site 490980002P03, located in King County. While sufficient valid air quality data exist for the calibrated analysis of the entire Puget Sound area, the degree of resolution for the AISA would not be adequate. Consequently, it was necessary to use an uncalibrated AQDM.

Input data used in the dispersion model are presented in paragraph 4.2. Procedures and results of the three AQDM runs used in projecting air quality are described in paragraph 4.3.

The uncalibrated AQDM generates air quality as annual arithmetic means. The national ambient air quality standards (NAAQS) are expressed as geometric means. While secondary particulate standards are expressed in terms of not exceeding a daily average of 150 $\mu g/m^3$ more than once a year, attainment of an annual geometric mean of 60 $\mu g/m^3$ is considered to be a guide to attaining the secondary standard. Statistical procedures are used to demonstrate this in the analysis appearing in section 5 of this report. Procedures also exist by which geometric means can be estimated from arithmetic means. These are also used in the analysis portion of this report.

4.2 INPUT DATA

4.2.1 METEOROLOGICAL

Meteorological data suitable for AQDM are available for the Seattle/Tacoma International Airport (SEATAC), Boeing Field in Seattle, and McChord Air Force Base in the Tacoma area. Wind data for 1973 are available from a station in Tukwila at the northern end of the service area. Partial 1974 wind data are available from a station in Kent. Surface wind data are the most sensitive meteorological input to the AQDM; therefore it is desirable to use wind data from within the area being analyzed. While the Kent data would be more representative of the AISA, they cannot be used because they represent only a portion of 1974 while the baseline year air quality and emissions data used in the AQDM are for 1973. Tukwila surface winds data, therefore, were selected for use in preparing the stability wind roses. Other meteorological inputs to stability wind rose preparation, i.e., cloud cover, precipitation, temperature, and pressure, are less sensitive. In general annual averages of these data do not vary within an air basin. SEATAC data can be considered to be applicable throughout the AISA. Consequently, it was determined, considering local conditions and availability of meteorological data, that the best approach would be the synthesis of stability wind roses using Tukwila surface winds and appropriate supplemental data from SEATAC.

Use of the synthesized stability wind roses is considered to provide more realistic meteorological data than using SEATAC data alone. The SEATAC weather station is located on high ground to the west and approximately 400 feet above the valley floor. The winds at Tukwila, located in the valley, are more likely to be typical of those affecting pollutant dispersions in the Auburn area. Data, other than wind speed and direction, from SEATAC are more apt to be representative of the service area than any other available data. It must be noted, however, that the wind roses synthesized from the one year (1973) of available data from Tukwila and corresponding SEATAC data must be assumed to be typical and suitable for use as the long-term average data required for projecting future air quality.

Consequently a program was developed by RTI for the IBM 370/165 system, to extract pertinent data for Tukwila (data furnished by PSAPCA) in punched card form and from 1973 SEATAC data (provided by EPA/Durham on magnetic tape) to develop the synthesized stability wind roses. Table B-3 contains a description of the product. (A copy of the Tukwila-SEATAC program is being delivered to Region X under separate cover).

Other meteorological inputs used with the AQDM are:

Mixing depth[5] - 940 meters (average of morning and afternoon)
Ambient temperature[6] - 284°K
Ambient pressure[7] - 1013 Millibars

4.2.2 EMISSIONS

The emission inventories, point and area sources, described in sections 2 and 3 were used as input to the AQDM. The area sources

TABLE B-3. SEATAC - TUKWILA STABILITY WIND ROSE

WIND DIRECTION	A	B	C	D	E	TOTAL
N	.12	1.45	1.54	4.77	5.55	13.42
NNE	.08	.72	.81	1.48	1.29	4.38
NE	.04	.24	.08	.50	.66	1.52
ENE	0	.12	.20	.41	.35	1.09
E	0	.12	.08	.69	.65	1.54
ESE	0	.08	.20	.58	.30	1.17
SE	.04	.04	.04	.90	.48	1.51
SSE	0	.48	.29	2.23	.31	3.31
S	08	1.37	1.84	16.97	5.06	25.32
SSW	0	.44	.57	13.58	5.05	19.64
SW	.04	.56	.89	6.80	.62	8.92
WSW	.04	.52	.56	3.01	.62	4.75
W	.04	.36	.28	.78	.54	2.00
WNW	.04	.36	.08	.21	.26	0.95
NW	0	.44	.68	.98	1.06	3.16
NNW	.12	.64	.85	1.77	3.94	7.32
TOTAL	.64	7.96	9.0	55.64	26.76	100.

A. Extremely unstable
B. Unstable
C. Slightly unstable
D. Neutral
E. Slightly Stable - Stable & Extremely Stable

Total cases including calm 250.0
Calm 94
*includes calms
2920 abs @ 8 per day X 365 days. 2500/2920 = 85.62% data available.
3.76% Calm
Source: RTI generated

listed in Table B-2 for PSGC AAM zones 3100, 3130, and 3140 were subdivided into one kilometer squares in order to obtain more resolution in the vicinity of Auburn, site of the highest reported 1973 concentrations in the AISA. Area emissions were distributed uniformly in these one square kilometer areas. Area source emissions for the other PSGC AAM zones were introduced to the AQDM as area sources with centroid locations as shown in Table B-2. The AQDM program converted these areas into equivalent squares and assigned the emissions from the AAM zone to that area.

For determining the impact of growth in the Auburn area on air quality in Seattle and Tacoma, the increase in emissions was determined by subtracting 1973 emissions from 1990 emissions and using the emission changes as input.

4.3 AQDM ANALYSIS

Three AQDM runs were used in estimating the air quality impact of the Auburn Interceptor: 1) Current conditions based on 1973 emissions, 2) 1990 conditions based on 1973 point source emissions and projected 1990 area source emissions, and 3) impact on Seattle and Tacoma from growth in the AISA. These runs are described below.

4.3.1 CURRENT CONDITIONS

The 1973 air quality situation in the Auburn area is considered to be that developed by PSAPCA. The highest reading in the AISA is at monitoring site 490100003I01 where the 1973 annual arithmetic mean for particulates is reported as being 68 $\mu g/m^3$. This concentration consists of three components--1) natural background, 2) contributions from sources within the AISA, and 3) contributions from unquantifiable emission sources.

Background concentrations are assumed to be those occurring at site 490980002P03, at the Washington State Fish Hatchery, in King County. The 1973 annual arithmetic mean at that station is reported as being 32 $\mu g/m^3$.

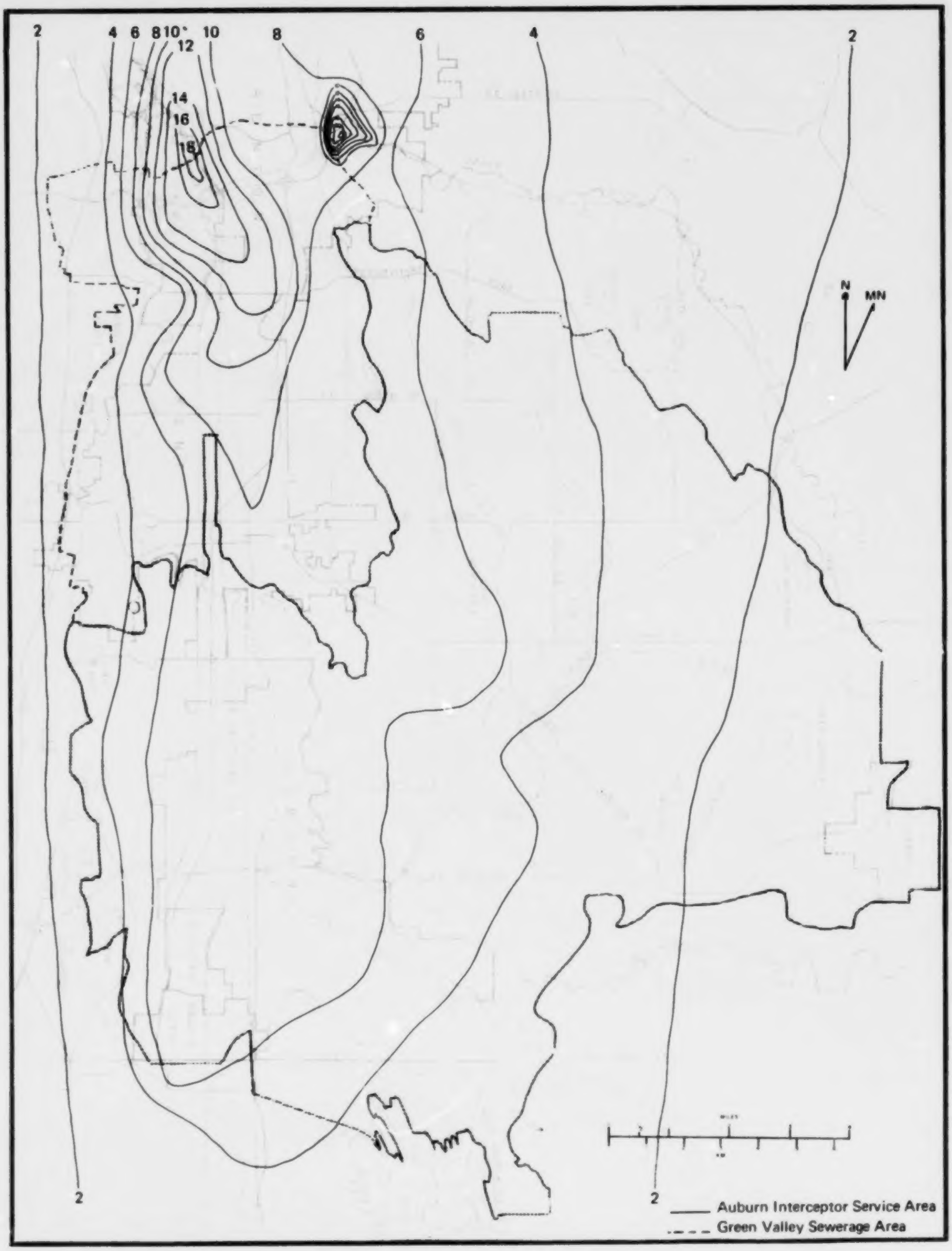
Contributions from sources within the AISA are estimated by AQDM using an uncalibrated model and a linear regression with a slope of '1' and an intercept of '0'. Results of this modeling are shown in isopleth form in Figure B-3. The monitoring site at Auburn was input to the AQDM as a special receptor. The model estimated that sources within the AISA accounted for 10.3 $\mu g/m^3$ at that site, 57.7 $\mu g/m^3$ coming from natural background and unquantifiable sources. Detailed input and output from this AQDM run are given in Supplement 1.

Unquantifiable emission sources fall into three classes, 1) emissions transported from outside sources, 2) emissions from sources within the AISA and not included in the 1973 point and area emission inventories, and 3) emissions equivalent to the errors inherent in an uncalibrated AQDM. For 1973, contributions from unquantifiable emission sources are estimated to be 35.7 $\mu g/m^3$ [68 (1973 mean) - 10.3 (contributions from sources within the AISA) - 32 (natural background)].

Estimated ambient air suspended particulate concentrations have been developed by PSAPCA.[8] These are shown in Figure B-4.

4.3.2 PROJECTED CONDITIONS

Using the 1973 contribution from other than sources within the AISA as the intercept, the 1990 air quality can be estimated using AQDM. It is recognized that the contributions from unquantifiable sources should be adjusted by the degree that emissions transported into the AISA would be changed due to growth or as sources come into compliance with PSAPCA Regulation I. If NAAQS are to be attained in the Puget Sound area, overall emissions must be reduced. PSAPCA has reported annual geometric means of 111 and 82 $\mu g/m^3$ in Seattle and Tacoma, respectively.[8] The guide for attainment of secondary standards is 60 $\mu g/m^3$. The magnitude of this change is subject to the degree of additional control that may be applied and the impact of growth. The uncertainties as to the impact of these factors on 1990 emissions as well as the problems of determining the magnitude of other unquantifiable emissions suggest that the conservative approach would be to assume, at least for the purposes of this analysis, that 1990 contributions to ambient air concentrations in the AISA will not be greater than those for 1973. Consequently, an intercept of 57.7 $\mu g/m^3$ (1973 contributions from other than known sources within the AISA) will be used as the intercept in the AQDM analysis of 1990 air quality.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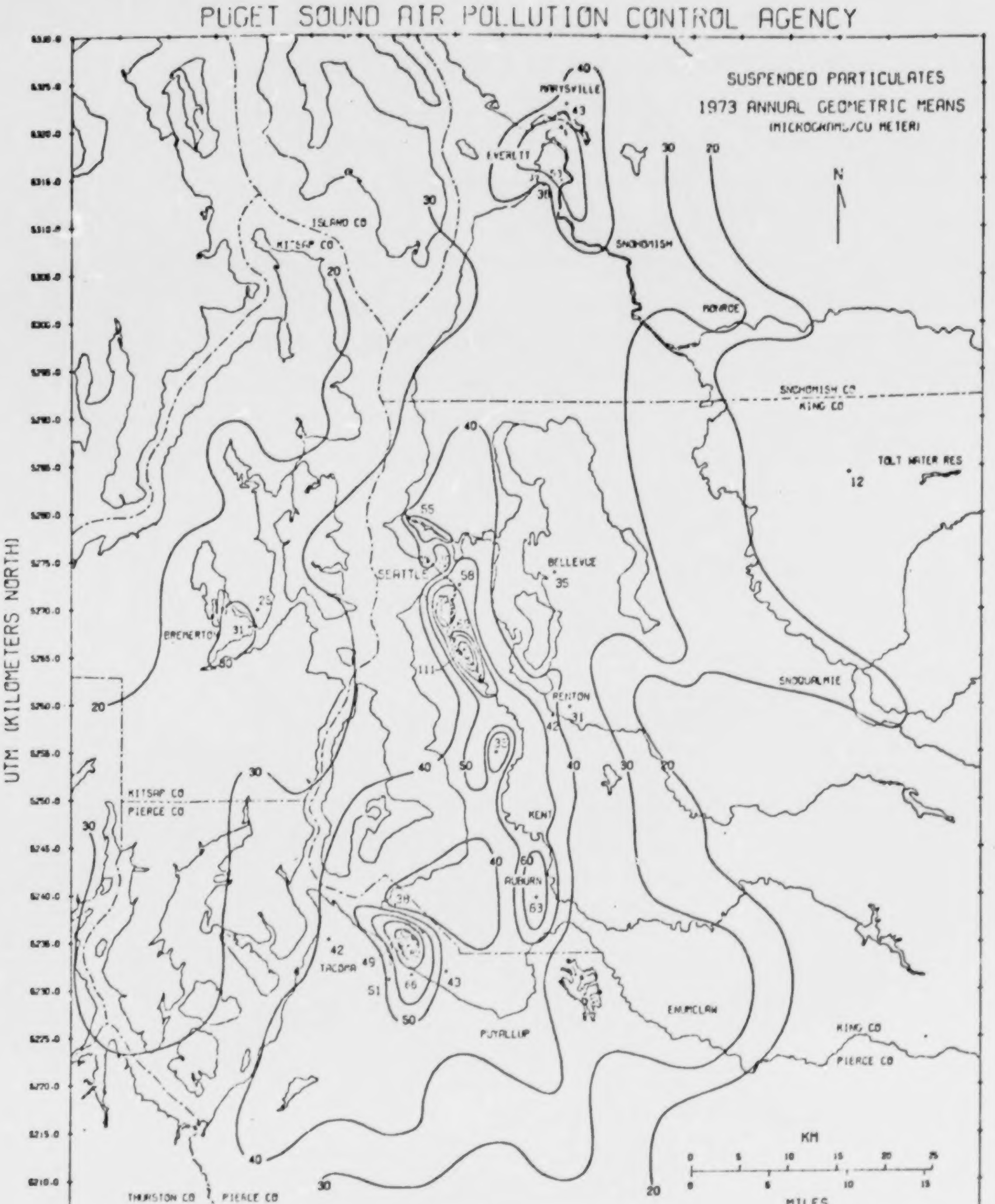
Green Valley Sewerage Area

Figure B-3. Contributions to 1973 Suspended Particulate Ambient Air Concentrations from Sources within the Auburn Interceptor Service Area (micrograms/cubic meter)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SNOHOMISH
MONROE
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KITSAP CO
SNOHOMISH CO
KING CO
TOLT WATER RES
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BREMERTON
RENTON
SNOQUALMIE
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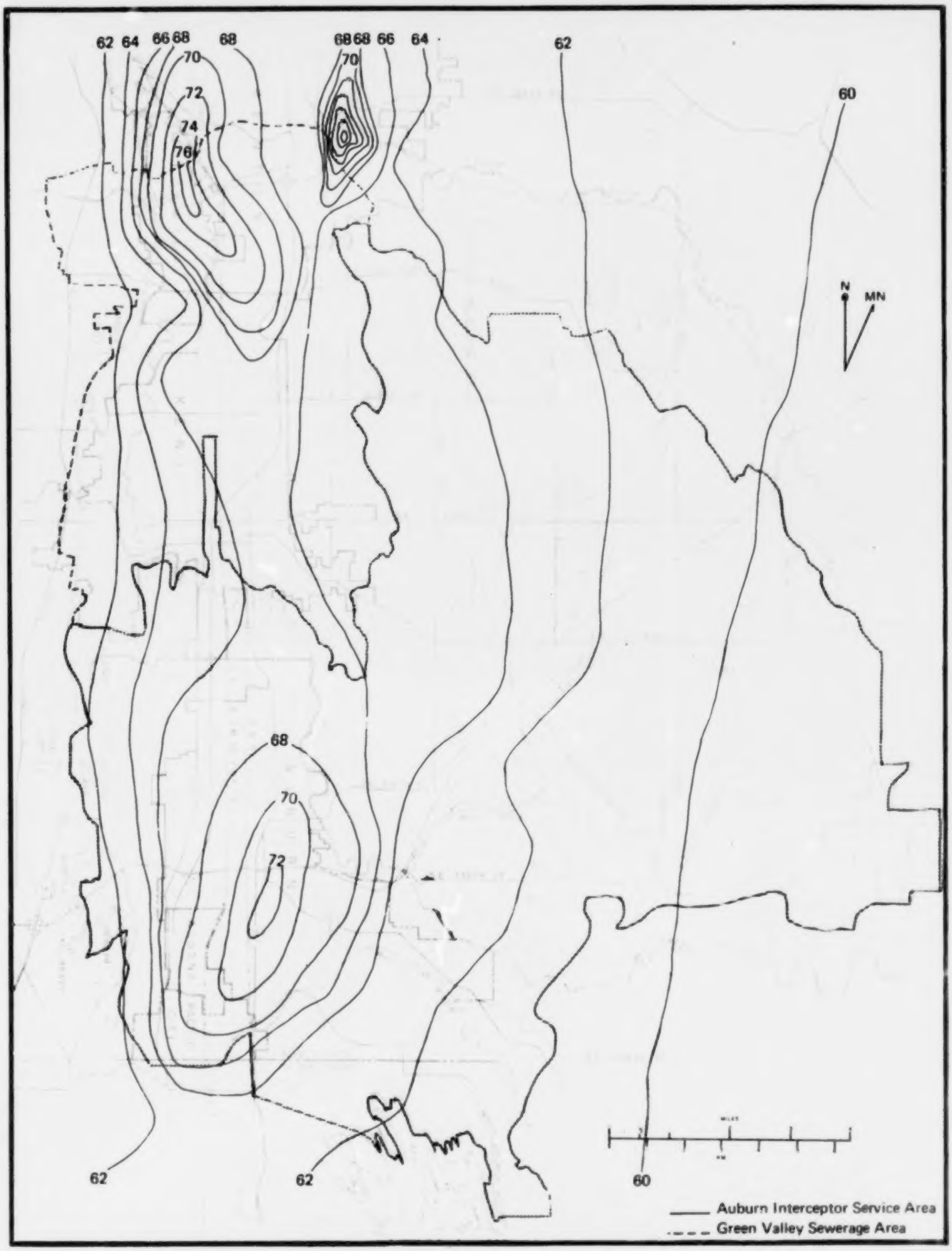
Figure B-4. Suspended Particulates, 1973 Annual Geometric Means (Micrograms/CU Meter)

Source: PSAPCA

Using the 1990 emission data developed in sections 2 and 3, the synthesized SEATAC-Tukwila stability wind roses, and an AQDM the estimated 1990 air quality in the AISA is as shown in Figure B-5. Detailed AQDM input and output are presented in Supplement 2.

4.3.3 IMPACT ON SEATTLE AND TACOMA

The impact of growth and development in the Auburn area resulting from the construction of the interceptor sewer can be estimated using an uncalibrated AQDM and emission growth as input. Six receptor sites in the Seattle area and six in the Tacoma area are introduced into AQDM as special receptors. Results of this analysis, shown in Table B-4, indicate that projected growth in the AISA will have negligible impact on ambient air concnetrations of suspended particulates in Seattle and Tacoma. Detailed AQDM input and output are presented in Supplement 3.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Auburn Interceptor Service Area
Green Valley Sewerage Area

Figure B-5. Projected 1990 Isopleths, Suspended Particulate Geometric Means (micrograms/cubic meter)

TABLE B-4. CONTRIBUTIONS & GROWTH IN AUBURN INTERCEPTOR SERVICE AREA ON PARTICULATE CONCENTRATIONS IN SEATTLE AND TACOMA

SITE CODE	LOCATION			Impact of Auburn Growth On 1990 Air Quality $\mu g/m^3$
	City	Easting	Northing	
490120001I01	Bellevue	564.5	5275.0	0.3
490120002I01	Bellevue	560.4	5273.6	0.4
491840002F01	Seattle	550.3	5272.1	0.2
491840005I01	Seattle	550.6	5269.0	0.2
491840006I01	Seattle	554.5	5266.2	0.3
491840059F01	Seattle	554.8	5267.7	0.3
492140001A01	Tacoma	542.8	5233.3	0.1
492140001F01	Tacoma	542.1	5233.4	0.1
492140001I01	Tacoma	542.1	5233.4	0.1
492140004I01	Tacoma	545.0	5234.4	0.1
492140006F01	Tacoma	545.3	5231.4	0.1
491560001I01	Pierce Co.	549.0	5231.7	0.1

(Page B-26 is omitted)

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

The conclusions derived from analysis of the 1973 contributions to ambient air concentrations from sources within the AISA, and the projected impact of growth on 1990 air quality must be considered in light of the following assumptions and procedures underlying the AQDM analyses.

a. Use of an uncalibrated AQDM because of the unavailability of sufficient valid air quality data for the area under analysis.

b. Use of stability wind roses synthesized from 1973 SEATAC and Tukwila meteorological data, and assumption that the synthesized data are typical of long term conditions.

c. Assumption that growth in the AISA would result in development patterns similar to those currently existing in the Kent area.

d. Method of estimating contributions from sources outside the AISA (primarily from sources in Seattle and Tacoma) and inclusion of this contribution in the background concentration used as the intercept for the 1990 AQDM analysis.

As mentioned in section 3, AQDM analysis produces concentrations expressed as annual arithmetic means. To permit comparison with NAAQS, expressed as geometric means, the arithmetic means must be converted. Air quality data from receptor site 490100003I01, located in Auburn, show the following relationship between aritihmetic and geometric means:

$\mu g/m^3$

Year	Annual Average Arithmetic Mean (m)	Geometric Mean (m_g)	Geometric Standard Deviation (s_g)
1974	57	51	1.63
1973	68	63	1.52
1972	62	55	1.62
1971	57	52	1.52
Average	61.0	55.3	1.572

Arithmetic means can be converted to geometric means using the following relationship:[9]

$$m_g = \frac{m}{\exp(0.5\ \ln^2 s_g)}$$

Using the data presented above the relationship between m_g and m is calculated as being:

$$m_g = \frac{m}{1.1077}$$

5.2 CONCLUSIONS AND RECOMMENDATIONS

In the discussions that follow, annual concentrations are expressed as annual geometric means unless otherwise indicated. Arithmetic means are converted to geometric means using the relationship developed in paragraph 5.1 above.

Based on the uncalibrated AQDM analysis, the highest projected 1990 TSP concentration will occur at monitoring site 490100003I01 in Auburn. This site also had the highest 1973 concentrations in the AISA. Projected ambient air concentrations are estimated to be 64 $\mu g/m^3$ at this site. This concentration consists of the following components:

	Annual Averages $\mu g/m^3$ Arithmetic Mean	Geometric Mean
From sources within the AISA	13.2	11.9
Natural background	32.0	28.9
From unquantified sources	25.7	23.2
Total	70.9	64.0

Corresponding data for 1973 are:

	Annual Averages $\mu g/m^3$ Arithmetic Mean	Geometric Mean
From sources within the AISA	10.3	9.3
Natural background	32.0	28.9
From unquantifiable sources	25.7	23.2
Total	68.0	61.4

It should be noted that the estimated total geometric mean in 1973 is different from the 63 $\mu g/m^3$ reported by PSAPCA. This is the result of using a four year average geometric standard deviation in converting from arithmetic to geometric means.

Potential reduction in contributions from unquantifiable sources as they come into compliance has not been taken into consideration in arriving at the preceeding air quality estimates. In actuality, however, some reduction could be expected. Maximum reduction would occur if all unquantifiable sources were assumed to be outside the AISA. Based on data available at EPA Region X, 1973 and 1990 emissions from point sources outside the AISA are estimated at 13,780 and 5,600 tons respectively (Detailed calculations from which these data were obtained are available at EPA Region X). Assuming the same change in emissions from area sources as will be experienced in the AISA for sources outside the AISA, (From data in table B-2, this is calculated as being 1.212) the following estimated ration of total 1990 and 1973 emissions can be determined.

	Emissions, tons/year	
	1973	1990
Point sources		
Point sources	13,780	5,600
Area sources	15,200	18,430
Total	28,980	24,030

Ratio 1990 to 1973 24,030 ÷ 28,980 = 0.83

Applying this ratio to the previously estimated 1990 air quality results in the following:

	Air Quality, $\mu g/m^3$
From sources within the AISA	11.9
Natural background	28.9
From unquantifiable sources	19.3 (23.3 x 0.83)
Total	60.1

This estimates probably represents the most optimistic one. The most extreme estimate of 1990 air quality would result in assuming that the 1973 observed particulate concentrations at Auburn had only two components, natural background and from sources within the AISA. Under these conditions estimates of 1990 air quality is 70.5 μg/m^3 calculated as shown below.

	Concentrations, μg/m^3 1973	1990	
From sources within the AISA	32.5(by difference)	41.6	[(32.5 x 11.9) ÷ 9.3]
Natural background	28.9	28.9	
Total	61.4	70.5	

The foregoing analysis indicates the 1990 projected air quality at Auburn under worst case, best case, and probable conditions to be:

Worst case (no contributions from unquantifiable sources)	70.5 μg/m^3
Most probable case (no reduction in contributions from unquantifiable sources)	64.0 μg/m^3
Best case (reduction in contributions from unquantifiable sources)	60.1 μg/m^3

The impact of these projected emissions can be determined by assuming a log normal distribution and using Larsen's transformation to estimate the second highest daily average. The geometric standard deviation of 1.572, calculated in paragraph 5.1 is used. The process is shown in Figure B-6. Estimated second highest daily averages are estimated to be 225, 205, and 190 μg/m^3, for the worst case, most probable case, and best case, respectively.

Isopleths, developed by the AQDM analysis indicate a high concentration in the Renton area, 69.4 μg/m^3 (arithmetic mean of 76.89 μg/m^3). This concentration can be attributed to the point sources in the vicinity of the receptor site. When considered in the light of an earlier calibrated AQDM analysis of the Seattle area, including Renton,[10] that estimated air quality under full Regulation I control at approximately 50 μg/m^3 annual arithmetic mean concentration, the concentration projected by the unclaibrated model appear to be on the high side. However, this is expected using an uncalibrated AQDM[11]. They also appear high when compared with PSAPCA estimates of 1970 concentrations of 42 and 55 μg/m^3 in the Renton/Tukwila area. (see Figure B-4)

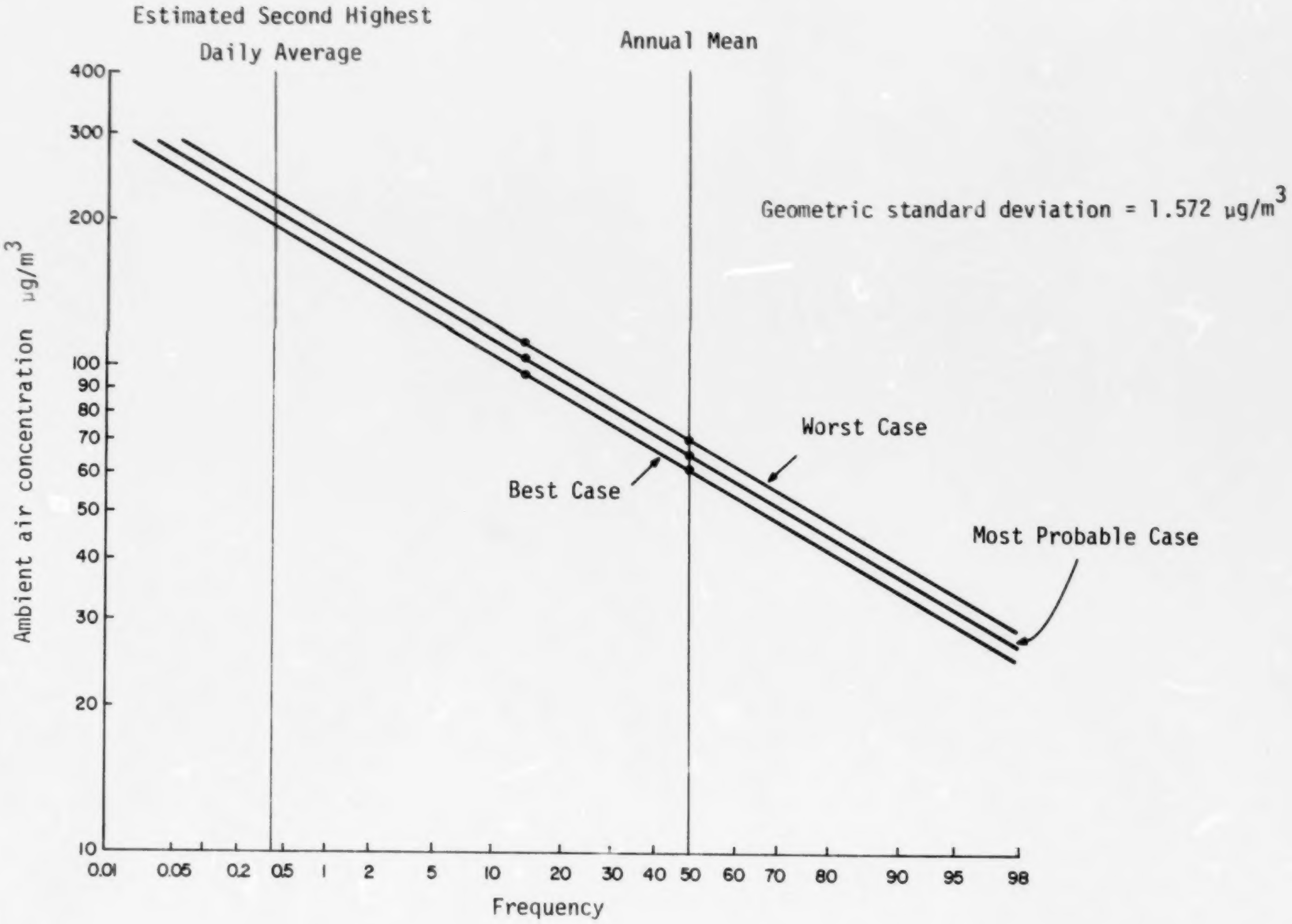

Figure B-6. Estimated 1990 Second Highest Daily Average at Auburn

The analysis indicates that the 1990 projected air quality at the site within the AISA having the maximum reported 1973 concentration falls between 60 and 71 $\mu g/m^3$. These concentrations correspond to estimated second high daily averages of 190 and 225 $\mu g/m^3$, respectively. The first figure assumes a contribution from unquantifiable sources within and outside of the AISA, the second, no contribution from these sources. This suggests that the air quality situation in the AISA is sensitive to contributions from sources outside the area and sources that may not presently be included in the emission inventory. The projected air quality that would result from projected growth and development appears to be marginal. The matter, however, should be continuously reviewed and refined by the initiation of a program to collect valid air quality data from representative sites within the AISA to serve as the basis for further refinement of the AISA analysis. Collection of such data will permit the use of a calibrated dispersion model. Such action will most likely be required in the preparation of an air quality maintenance plan for the Puget Sound Intrastate AQCR in which the AISA is located. The generation of air quality data suitable for use in a calibrated AQDM will also facilitate PSAPCA new source review for the evaluation of air quality impact of new point sources that may locate in the AISA as part of the projected growth and development.

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11. Busse, A.D., and J.R. Zimmerman, Appendix E., "An Evaluation of Some Climatological Dispersion Models," in User's Guide for the Climatological Dispersion Model, EPA-RA-73-024, U.S. Environmental Protection Agency, December 1973.

SUPPLEMENT 1

AQDM Input and Output Printouts, 1973 AQDM Analysis

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AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

SOURCE DATA

SOURCE NUMBER	SOURCE LOCATION (KILOMETERS)		SOURCE AREA	ANNUAL SOURCE EMISSION RATE (TONS/DAY)		STACK DATA			
	HORIZONTAL	VERTICAL	SQUARE KILOMETERS	SO2	PART	HT (M)	DIAM (M)	VEL (M/SEC)	TEMP (DEG.K)
1	553.0	5236.0	0.0	0.0	0.029	13.1	0.9	68.9	422.
2	558.4	5250.3	0.0	0.0	0.254	12.2	1.4	35.9	454.
3	566.4	5242.1	0.0	0.0	0.318	6.1	1.2	10.8	355.
4	570.0	5249.0	0.0	0.0	0.011	14.0	1.2	0.0	505.
5	557.9	5249.3	0.0	0.0	0.003	9.1	0.5	3.4	422.
6	555.7	5253.7	0.0	0.0	0.050	12.2	3.0	25.5	422.
7	560.4	5236.8	0.0	0.0	0.012	6.1	0.5	10.9	422.
8	553.0	5247.5	0.0	0.0	0.004	7.6	1.5	9.4	394.
9	557.5	5248.2	0.0	0.0	0.022	10.3	0.9	0.0	422.
10	557.0	5258.0	0.0	0.0	0.002	15.2	0.6	2.4	422.
11	558.5	5238.5	0.0	0.0	0.004	15.2	0.9	4.8	422.
12	557.6	5254.5	0.0	0.0	0.179	0.0	0.0	0.0	284.
13	556.0	5254.0	0.0	0.0	0.230	0.0	0.0	0.0	284.
14	560.6	5258.5	0.0	0.0	0.372	0.0	0.0	0.0	284.
15	556.5	5256.3	0.0	0.0	0.523	0.0	0.0	0.0	284.
16	562.4	5238.5	0.0	0.0	0.005	0.0	0.0	0.0	339.
17	555.7	5234.7	0.0	0.0	0.055	0.0	0.0	0.0	0.
18	557.3	5237.5	0.0	0.0	0.029	0.0	0.0	0.0	0.
19	560.5	5235.4	0.0	0.0	0.025	0.0	0.0	0.0	0.
20	[illegible]	5238.3	0.0	0.0	0.041	0.0	0.0	0.0	0.
21	563.5	5234.8	38.28	0.0	0.075	5.0	0.0	0.0	0.
22	555.2	5235.8	11.12	0.0	0.108	5.0	0.0	0.0	0.
23	558.4	5247.4	9.12	0.0	0.091	5.0	0.0	0.0	0.
24	555.7	5244.8	13.79	0.0	0.115	5.0	0.0	0.0	0.
25	561.3	5235.1	12.31	0.0	0.061	5.0	0.0	0.0	0.
26	565.8	5239.6	44.07	0.0	0.237	5.0	0.0	0.0	0.
27	561.5	5237.7	7.95	0.0	0.070	5.0	0.0	0.0	0.
28	561.9	5243.6	10.93	0.0	0.100	5.0	0.0	0.0	0.
29	570.9	5240.6	45.63	0.0	0.191	5.0	0.0	0.0	0.
30	570.2	5245.7	34.46	0.0	0.135	5.0	0.0	0.0	0.
31	562.0	5246.9	4.37	0.0	0.059	5.0	0.0	0.0	0.
32	565.5	5246.1	23.13	0.0	0.136	5.0	0.0	0.0	0.
33	566.8	5251.1	30.17	0.0	0.162	5.0	0.0	0.0	0.
34	563.8	5249.9	5.23	0.0	0.057	5.0	0.0	0.0	0.
35	557.4	5249.1	1.32	0.0	0.032	5.0	0.0	0.0	0.
36	562.8	5253.1	8.65	0.0	0.113	5.0	0.0	0.0	0.
37	562.0	5255.3	2.24	0.0	0.020	5.0	0.0	0.0	0.
38	555.5	5234.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
39	557.5	5234.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
40	554.5	5235.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
41	557.5	5235.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
42	553.5	5235.0	1.00	0.0	0.023	5.0	0.0	0.0	0.
43	556.5	5236.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
[illegible]	[illegible]	[illegible]	1.00	0.0	0.030	5.0	0.0	0.0	0.

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45	558.5	5236.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
46	559.5	5236.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
47	556.5	5237.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
48	557.5	5237.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
49	558.5	5237.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
50	559.5	5237.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
51	556.5	5238.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
52	557.5	5238.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
53	558.5	5238.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
54	559.5	5238.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
55	555.5	5239.0	1.00	0.0	0.018	5.0	0.0	0.0	0.
56	556.5	5239.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
57	557.5	5239.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
58	558.5	5239.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
59	559.5	5239.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
60	554.5	5240.0	1.00	0.0	0.018	5.0	0.0	0.0	0.
61	555.5	5240.0	1.00	0.0	0.018	5.0	0.0	0.0	0.
62	556.5	5240.0	1.00	0.0	0.011	5.0	0.0	0.0	0.
63	557.5	5240.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
64	558.5	5240.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
65	559.5	5240.0	1.00	0.0	0.017	5.0	0.0	0.0	0.
66	554.5	5241.0	1.00	0.0	0.021	5.0	0.0	0.0	0.
67	555.5	5241.0	1.00	0.0	0.018	5.0	0.0	0.0	0.
68	556.5	5241.0	1.00	0.0	0.034	5.0	0.0	0.0	0.
69	554.5	5242.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
70	555.5	5242.0	1.00	0.0	0.018	5.0	0.0	0.0	0.
71	556.5	5242.0	1.00	0.0	0.018	5.0	0.0	0.0	0.
72	558.0	5241.5	4.00	0.0	0.051	5.0	0.0	0.0	0.
73	560.0	5241.5	4.00	0.0	0.051	5.0	0.0	0.0	0.
74	558.0	5243.5	4.00	0.0	0.051	5.0	0.0	0.0	0.
75	560.0	5243.5	4.00	0.0	0.051	5.0	0.0	0.0	0.

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

RECEPTOR DATA

LOCATIONS TO BE USED AS RECEPTORS IN ADDITION TO THE 221 RECTANGULAR GRID LOCATIONS

RECEPTOR NUMBER	X-COORDINATE (KILOMETERS)	Y-COORDINATE (KILOMETERS)
222	558.4	5242.3
223	558.5	5239.5
224	562.0	5259.5
225	560.2	5258.5

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                 AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

                  METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

      MIXING DEPTH =  940. METERS
      AMBIENT TEMPERATURE =  284. DEGREES,KELVIN
      AMBIENT PRESSURE = 1013. MILLIBARS

      STABILITY CLASS  1
                                          WINDSPEED CLASS
        WIND DIRECTION      1        2        3        4        5        6

             N           0.0004   0.0008   0.0      0.0      0.0      0.0
             NNE         0.0004   0.0004   0.0      0.0      0.0      0.0
             NE          0.0004   0.0      0.0      0.0      0.0      0.0
             ENE         0.0      0.0      0.0      0.0      0.0      0.0
             E           0.0      0.0      0.0      0.0      0.0      0.0
             ESE         0.0      0.0      0.0      0.0      0.0      0.0
             SE          0.0004   0.0      0.0      0.0      0.0      0.0
             SSE         0.0      0.0      0.0      0.0      0.0      0.0
             S           0.0004   0.0004   0.0      0.0      0.0      0.0
             SSW         0.0      0.0      0.0      0.0      0.0      0.0
             SW          0.0      0.0004   0.0      0.0      0.0      0.0
             WSW         0.0004   0.0      0.0      0.0      0.0      0.0
             W           0.0      0.0004   0.0      0.0      0.0      0.0
             WNW         0.0      0.0004   0.0      0.0      0.0      0.0
             NW          0.0      0.0      0.0      0.0      0.0      0.0
             NNW         0.0      0.0012   0.0      0.0      0.0      0.0
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT 6 AREA, REV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 2

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0033	0.0068	0.0044	0.0	0.0	0.0
NNE	0.0048	0.0024	0.0	0.0	0.0	0.0
NE	0.0020	0.0004	0.0	0.0	0.0	0.0
ENE	0.0008	0.0004	0.0	0.0	0.0	0.0
E	0.0012	0.0	0.0	0.0	0.0	0.0
ESE	0.0008	0.0	0.0	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0044	0.0004	0.0	0.0	0.0	0.0
S	0.0117	0.0020	0.0	0.0	0.0	0.0
SSW	0.0024	0.0016	0.0004	0.0	0.0	0.0
SW	0.0020	0.0016	0.0020	0.0	0.0	0.0
WSW	0.0012	0.0036	0.0004	0.0	0.0	0.0
W	0.0012	0.0020	0.0004	0.0	0.0	0.0
WNW	0.0020	0.0016	0.0	0.0	0.0	0.0
NW	0.0004	0.0016	0.0024	0.0	0.0	0.0
NNW	0.0028	0.0032	0.0004	0.0	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PI & AREA, REV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 3

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0010	0.0056	0.0050	0.0008	0.0	0.0
NNE	0.0033	0.0008	0.0036	0.0004	0.0	0.0
NE	0.0008	0.0	0.0	0.0	0.0	0.0
ENE	0.0016	0.0	0.0004	0.0	0.0	0.0
E	0.0004	0.0	0.0004	0.0	0.0	0.0
ESE	0.0012	0.0	0.0008	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0025	0.0004	0.0	0.0	0.0	0.0
S	0.0100	0.0064	0.0020	0.0	0.0	0.0
SSW	0.0029	0.0020	0.0004	0.0004	0.0	0.0
SW	0.0013	0.0012	0.0052	0.0012	0.0	0.0
WSW	0.0008	0.0012	0.0036	0.0	0.0	0.0
W	0.0004	0.0016	0.0004	0.0008	0.0	0.0
WNW	0.0008	0.0004	0.0	0.0	0.0	0.0
NW	0.0000	0.0016	0.0052	0.0	0.0	0.0
NNW	0.0013	0.0024	0.0044	0.0008	0.0	0.0

AUBURN,NY, INTERCEPTOR SERVICE AREA (1973 PT 6 AREA, REV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 4	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0077	0.0184	0.0172	0.0088	0.0	0.0
NNE	0.0048	0.0056	0.0036	0.0008	0.0	0.0
NE	0.0018	0.0028	0.0004	0.0	0.0	0.0
ENE	0.0037	0.0004	0.0	0.0	0.0	0.0
E	0.0025	0.0004	0.0020	0.0020	0.0	0.0
ESE	0.0018	0.0028	0.0	0.0012	0.0	0.0
SE	0.0046	0.0024	0.0004	0.0012	0.0004	0.0
SSE	0.0127	0.0076	0.0020	0.0	0.0	0.0
S	0.0349	0.0632	0.0336	0.0152	0.0024	0.0004
SSW	0.0246	0.0476	0.0364	0.0280	0.0040	0.0012
SW	0.0052	0.0196	0.0256	0.0160	0.0015	0.0
WSW	0.0041	0.0096	0.0109	0.0056	0.0	0.0
W	0.0018	0.0028	0.0028	0.0004	0.0	0.0
WNW	0.0013	0.0004	0.0004	0.0	0.0	0.0
NW	0.0030	0.0016	0.0040	0.0012	0.0	0.0
NNW	0.0061	0.0076	0.0040	0.0	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PI & AREA, REV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 5

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0251	0.0248	0.0056	0.0	0.0	0.0
NNE	0.0069	0.0056	0.0004	0.0	0.0	0.0
NE	0.0034	0.0024	0.0008	0.0	0.0	0.0
ENE	0.0023	0.0008	0.0004	0.0	0.0	0.0
E	0.0037	0.0012	0.0016	0.0	0.0	0.0
ESE	0.0019	0.0008	0.0004	0.0	0.0	0.0
SE	0.0037	0.0008	0.0004	0.0	0.0	0.0
SSE	0.0023	0.0008	0.0	0.0	0.0	0.0
S	0.0314	0.0176	0.0016	0.0	0.0	0.0
SSW	0.0205	0.0268	0.0032	0.0	0.0	0.0
SW	0.0039	0.0024	0.0	0.0	0.0	0.0
WSW	0.0025	0.0028	0.0008	0.0	0.0	0.0
W	0.0029	0.0024	0.0	0.0	0.0	0.0
WNW	0.0010	0.0012	0.0004	0.0	0.0	0.0
NW	0.0050	0.0048	0.0008	0.0	0.0	0.0
NNW	0.0162	0.0212	0.0020	0.0	0.0	0.0

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                    AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

INPUT REGRESSION PARAMETERS ARE:

    POLLUTANT          Y-INTERCEPT        SLOPE

    PARTICULATES              0.0         1.0000
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, B2V)

RECEPTOR CONCENTRATION DATA				
RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT.	SO2	PARTICULATES
1	550.0	5230.0	0.0	1.089
2	550.0	5232.0	0.0	1.067
3	550.0	5234.0	0.0	1.100
4	550.0	5236.0	0.0	1.090
5	550.0	5238.0	0.0	1.082
6	550.0	5240.0	0.0	1.063
7	550.0	5242.0	0.0	1.051
8	550.0	5244.0	0.0	1.071
9	550.0	5246.0	0.0	1.077
10	550.0	5248.0	0.0	1.053
11	550.0	5250.0	0.0	1.067
12	550.0	5252.0	0.0	1.088
13	550.0	5254.0	0.0	1.159
14	550.0	5256.0	0.0	1.142
15	550.0	5258.0	0.0	1.189
16	550.0	5260.0	0.0	1.164
17	550.0	5262.0	0.0	1.149
18	552.0	5230.0	0.0	1.499
19	552.0	5232.0	0.0	1.528
20	552.0	5234.0	0.0	1.584
21	552.0	5236.0	0.0	1.574
22	552.0	5238.0	0.0	1.586
23	552.0	5240.0	0.0	1.646
24	552.0	5242.0	0.0	1.652
25	552.0	5244.0	0.0	1.633
26	552.0	5246.0	0.0	1.657
27	552.0	5248.0	0.0	1.719
28	552.0	5250.0	0.0	1.714
29	552.0	5252.0	0.0	1.745
30	552.0	5254.0	0.0	1.746
31	552.0	5256.0	0.0	1.715
32	552.0	5258.0	0.0	1.797
33	552.0	5260.0	0.0	1.652
34	552.0	5262.0	0.0	1.656
35	554.0	5230.0	0.0	2.164
36	554.0	5232.0	0.0	2.277
37	554.0	5234.0	0.0	2.477
38	554.0	5236.0	0.0	2.924
39	554.0	5238.0	0.0	3.030
40	554.0	5240.0	0.0	3.684

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

RECEPTOR CONCENTRATION DATA				
RECEPTOR NUMBER	RECEPTOR LOCATION		EXPECTED ARITHMETIC MEAN	
	(KILOMETERS)		(MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
41	554.0	5242.0	0.0	4.133
42	554.0	5244.0	0.0	3.703
43	554.0	5246.0	0.0	3.397
44	554.0	5248.0	0.0	3.287
45	554.0	5250.0	0.0	3.192
46	554.0	5252.0	0.0	2.930
47	554.0	5254.0	0.0	3.217
48	554.0	5256.0	0.0	2.822
49	554.0	5258.0	0.0	3.129
50	554.0	5260.0	0.0	2.962
51	554.0	5262.0	0.0	2.314
52	556.0	5230.0	0.0	3.196
53	556.0	5232.0	0.0	3.357
54	556.0	5234.0	0.0	7.329
55	556.0	5236.0	0.0	9.024
56	556.0	5238.0	0.0	7.586
57	556.0	5240.0	0.0	7.677
58	556.0	5242.0	0.0	7.859
59	556.0	5244.0	0.0	6.571
60	556.0	5246.0	0.0	6.085
61	556.0	5248.0	0.0	5.750
62	556.0	5250.0	0.0	6.026
63	556.0	5252.0	0.0	8.599
64	556.0	5254.0	0.0	5.424
65	556.0	5256.0	0.0	14.582
66	556.0	5258.0	0.0	15.890
67	556.0	5260.0	0.0	12.167
68	556.0	5262.0	0.0	7.856
69	558.0	5230.0	0.0	7.700
70	558.0	5232.0	0.0	4.378
71	558.0	5234.0	0.0	5.992
72	558.0	5236.0	0.0	9.152
73	558.0	5238.0	0.0	10.590
74	558.0	5240.0	0.0	9.729
75	558.0	5242.0	0.0	8.374
76	558.0	5244.0	0.0	6.051
77	558.0	5246.0	0.0	7.518
78	558.0	5248.0	0.0	7.987
79	558.0	5250.0	0.0	8.998
80	558.0	5252.0	0.0	8.595

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, PEV)

RECEPTOR CONCENTRATION DATA				
RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
81	558.0	5254.0	0.0	13.421
82	558.0	5256.0	0.0	13.769
83	558.0	5258.0	0.0	8.222
84	558.0	5260.0	0.0	8.941
85	558.0	5262.0	0.0	8.183
86	560.0	5230.0	0.0	3.619
87	560.0	5232.0	0.0	3.396
88	560.0	5234.0	0.0	4.619
89	560.0	5236.0	0.0	6.749
90	560.0	5238.0	0.0	9.037
91	560.0	5240.0	0.0	9.150
92	560.0	5242.0	0.0	8.060
93	560.0	5244.0	0.0	7.758
94	560.0	5246.0	0.0	7.039
95	560.0	5248.0	0.0	6.671
96	560.0	5250.0	0.0	6.266
97	560.0	5252.0	0.0	5.500
98	560.0	5254.0	0.0	6.489
99	560.0	5256.0	0.0	7.284
100	560.0	5258.0	0.0	8.981
101	560.0	5260.0	0.0	7.352
102	560.0	5262.0	0.0	7.482
103	562.0	5230.0	0.0	3.317
104	562.0	5232.0	0.0	3.606
105	562.0	5234.0	0.0	3.361
106	562.0	5236.0	0.0	4.021
107	562.0	5238.0	0.0	5.002
108	562.0	5240.0	0.0	5.058
109	562.0	5242.0	0.0	5.504
110	562.0	5244.0	0.0	6.114
111	562.0	5246.0	0.0	6.424
112	562.0	5248.0	0.0	6.182
113	562.0	5250.0	0.0	6.366
114	562.0	5252.0	0.0	6.285
115	562.0	5254.0	0.0	6.446
116	562.0	5256.0	0.0	6.641
117	562.0	5258.0	0.0	5.387
118	562.0	5260.0	0.0	6.333
119	562.0	5262.0	0.0	6.926
120	564.0	5230.0	0.0	2.954

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
121	564.0	5232.0	0.0	3.197
122	564.0	5234.0	0.0	3.289
123	564.0	5236.0	0.0	3.702
124	564.0	5238.0	0.0	4.288
125	564.0	5240.0	0.0	5.294
126	564.0	5242.0	0.0	4.197
127	564.0	5244.0	0.0	6.989
128	564.0	5246.0	0.0	6.525
129	564.0	5248.0	0.0	5.850
130	564.0	5250.0	0.0	5.570
131	564.0	5252.0	0.0	5.474
132	564.0	5254.0	0.0	5.234
133	564.0	5256.0	0.0	4.855
134	564.0	5258.0	0.0	4.635
135	564.0	5260.0	0.0	4.634
136	564.0	5262.0	0.0	4.414
137	566.0	5230.0	0.0	2.513
138	566.0	5232.0	0.0	2.544
139	566.0	5234.0	0.0	2.690
140	566.0	5236.0	0.0	3.168
141	566.0	5238.0	0.0	3.418
142	566.0	5240.0	0.0	3.515
143	566.0	5242.0	0.0	3.227
144	566.0	5244.0	0.0	4.576
145	566.0	5246.0	0.0	5.130
146	566.0	5248.0	0.0	4.785
147	566.0	5250.0	0.0	4.653
148	566.0	5252.0	0.0	4.425
149	566.0	5254.0	0.0	4.147
150	566.0	5256.0	0.0	4.028
151	566.0	5258.0	0.0	3.989
152	566.0	5260.0	0.0	3.992
153	566.0	5262.0	0.0	3.835
154	568.0	5230.0	0.0	2.110
155	568.0	5232.0	0.0	2.129
156	568.0	5234.0	0.0	2.211
157	568.0	5236.0	0.0	2.381
158	568.0	5238.0	0.0	2.412
159	568.0	5240.0	0.0	2.496
160	568.0	5242.0	0.0	2.613

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
161	568.0	5244.0	0.0	2.837
162	568.0	5246.0	0.0	[illegible]
163	568.0	5248.0	0.0	3.400
164	568.0	5250.0	0.0	3.547
165	568.0	5252.0	0.0	3.519
166	568.0	5254.0	0.0	3.384
167	568.0	5256.0	0.0	3.378
168	568.0	5258.0	0.0	3.274
169	568.0	5260.0	0.0	3.344
170	568.0	5262.0	0.0	3.278
171	570.0	5230.0	0.0	[illegible]
172	570.0	5232.0	0.0	1.769
173	570.0	5234.0	0.0	1.743
174	570.0	5236.0	0.0	1.560
175	570.0	5238.0	0.0	1.859
176	570.0	5240.0	0.0	1.881
177	570.0	5242.0	0.0	[illegible]
178	570.0	5244.0	0.0	2.301
179	570.0	5246.0	0.0	[illegible]
180	570.0	5248.0	0.0	[illegible]
181	570.0	5250.0	0.0	3.490
182	570.0	5252.0	0.0	2.718
183	570.0	5254.0	0.0	[illegible]
184	570.0	5256.0	0.0	2.877
185	570.0	5258.0	0.0	2.914
186	570.0	5260.0	0.0	[illegible]
187	570.0	5262.0	0.0	2.626
188	572.0	5230.0	0.0	1.489
189	572.0	5232.0	0.0	[illegible]
190	572.0	5234.0	0.0	1.394
191	572.0	5236.0	0.0	1.343
192	572.0	5238.0	0.0	[illegible]
193	572.0	5240.0	0.0	1.461
194	572.0	5242.0	0.0	1.594
195	572.0	5244.0	0.0	[illegible]
196	572.0	5246.0	0.0	1.815
197	572.0	5248.0	0.0	1.855
198	572.0	5250.0	0.0	[illegible]
199	572.0	5252.0	0.0	2.065
200	572.0	5254.0	0.0	[illegible]

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

RECEPTOR CONCENTRATION DATA				
RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
201	572.0	5256.0	0.0	2.336
202	572.0	5258.0	0.0	2.403
203	572.0	5260.0	0.0	2.455
204	572.0	5262.0	0.0	2.437
205	574.0	5230.0	0.0	1.221
206	574.0	5232.0	0.0	1.157
207	574.0	5234.0	0.0	1.130
208	574.0	5236.0	0.0	1.069
209	574.0	5238.0	0.0	1.049
210	574.0	5240.0	0.0	1.180
211	574.0	5242.0	0.0	1.236
212	574.0	5244.0	0.0	1.214
213	574.0	5246.0	0.0	1.231
214	574.0	5248.0	0.0	1.338
215	574.0	5250.0	0.0	1.445
216	574.0	5252.0	0.0	1.489
217	574.0	5254.0	0.0	1.682
218	574.0	5256.0	0.0	1.835
219	574.0	5258.0	0.0	1.956
220	574.0	5260.0	0.0	2.013
221	574.0	5262.0	0.0	2.049
222	558.4	5242.3	0.0	8.337
223	558.5	5239.5	0.0	10.293
224	562.0	5259.5	0.0	6.969
225	560.2	5258.5	0.0	18.521

EFFECTIVE STACK HEIGHT (IN METERS) FOR EACH SOURCE

1	45.0
2	32.8
3	17.5
4	14.0
5	10.4
6	58.2
7	8.5
8	13.0
9	18.3
10	15.6
11	17.4
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.0
20	0.0
21	5.0
22	5.0
23	5.0
24	5.0
25	5.0
26	5.0
27	5.0
28	5.0
29	5.0
30	5.0
31	5.0
32	5.0
33	5.0
34	5.0
35	5.0
36	5.0
37	5.0
38	5.0
39	5.0
40	5.0
41	5.0
42	5.0
43	5.0
44	5.0
45	5.0
46	5.0
47	5.0
48	5.0
49	5.0

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        EFFECTIVE STACK HEIGHT (IN METERS) FOR EACH SOURCE

                   50                5.0
                   51                5.0
                   52                5.0
                   53                5.0
                   54                5.0
                   55                5.0
                   56                5.0
                   57                5.0
                   58                5.0
                   59                5.0
                   60                5.0
                   61                5.0
                   62                5.0
                   63                5.0
                   64                5.0
                   65                5.0
                   66                5.0
                   67                5.0
                   68                5.0
                   69                5.0
                   70                5.0
                   71                5.0
                   72                5.0
                   73                5.0
                   74                5.0
                   75                5.0
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT 6 AREA, REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 55	RECEPTOR 82	RECEPTOR 81
1	0.07 % 0.0124	0.07 % 0.0114	0.09 % 0.0125	0.12 % 0.0163	0.14 % 0.0187
2	1.61 % 0.2983	0.69 % 0.1104	0.38 % 0.0559	3.08 % 0.4189	4.54 % 0.6099
3	1.18 % 0.2186	0.37 % 0.0593	0.44 % 0.0645	0.54 % 0.0750	0.63 % 0.0847
4	0.01 % 0.0021	0.01 % 0.0013	0.01 % 0.0011	0.01 % 0.0015	0.01 % 0.0017
5	0.04 % 0.0073	0.03 % 0.0052	0.04 % 0.0053	0.10 % 0.0131	0.16 % 0.0209
6	0.11 % 0.0198	0.41 % 0.0655	0.54 % 0.0794	0.28 % 0.0379	0.09 % 0.0121
7	0.07 % 0.0130	0.05 % 0.0074	0.05 % 0.0077	0.08 % 0.0112	0.09 % 0.0122
8	0.02 % 0.0040	0.05 % 0.0084	0.07 % 0.0098	0.05 % 0.0064	0.04 % 0.0055
9	0.27 % 0.0505	0.29 % 0.0466	0.37 % 0.0536	0.62 % 0.0853	0.92 % 0.1237
10	0.01 % 0.0024	0.08 % 0.0127	0.05 % 0.0075	0.10 % 0.0134	0.05 % 0.0072
11	0.03 % 0.0052	0.03 % 0.0051	0.03 % 0.0045	0.04 % 0.0061	0.05 % 0.0070
12	3.71 % 0.6874	2.07 % 0.3293	2.89 % 0.4208	50.65 % 6.9741	51.31 % 6.8958
13	1.53 % 0.2843	14.69 % 2.3361	49.35 % 7.2836	6.13 % 0.8441	3.82 % 0.5129
14	72.99 % 13.5183	1.28 % 0.2034	1.11 % 0.1623	1.91 % 0.2629	2.47 % 0.3311
15	2.37 % 0.4394	66.63 % 10.5870	28.06 % 4.1412	15.44 % 2.1263	11.19 % 1.5025
16	0.03 % 0.0053	0.01 % 0.0020	0.01 % 0.0016	0.03 % 0.0037	0.03 % 0.0036
17	0.26 % 0.0490	0.35 % 0.0553	0.43 % 0.0624	0.43 % 0.0595	0.49 % 0.0664
18	0.05 % 0.0096	0.06 % 0.0094	0.07 % 0.0104	0.09 % 0.0120	0.10 % 0.0138
19	0.14 % 0.0256	0.10 % 0.0153	0.11 % 0.0158	0.16 % 0.0223	0.18 % 0.0242
20	0.26 % 0.0485	0.20 % 0.0316	0.23 % 0.0333	0.35 % 0.0479	0.40 % 0.0538
21	0.23 % 0.0420	0.14 % 0.0223	0.21 % 0.0312	0.27 % 0.0376	0.30 % 0.0399

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & APEL, REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 65	RECEPTOR 82	RECEPTOR 81
22	0.52 % 0.0964	0.70 % 0.1116	0.85 % 0.1239	0.84 % 0.1153	0.96 % 0.1282
23	0.56 % 0.1043	0.79 % 0.1251	0.98 % 0.1430	0.95 % 0.1306	1.12 % 0.1502
24	0.97 % 0.1614	1.22 % 0.1936	1.56 % 0.2270	1.53 % 0.2112	1.83 % 0.2497
25	0.25 % 0.0468	0.19 % 0.0299	0.21 % 0.0313	0.28 % 0.0389	0.31 % 0.0416
26	0.87 % 0.1610	0.64 % 0.1016	0.67 % 0.0983	0.90 % 0.1237	0.91 % 0.1218
27	0.35 % 0.0664	0.24 % 0.0387	0.28 % 0.0406	0.38 % 0.0522	0.43 % 0.0571
28	0.63 % 0.1173	0.39 % 0.0613	0.42 % 0.0609	0.66 % 0.0910	0.76 % 0.1016
29	0.30 % 0.0563	0.14 % 0.0217	0.16 % 0.0235	0.19 % 0.0263	0.20 % 0.0266
30	0.18 % 0.0328	0.11 % 0.0176	0.12 % 0.0175	0.15 % 0.0209	0.15 % 0.0216
31	0.44 % 0.0815	0.15 % 0.0232	0.12 % 0.0181	0.43 % 0.0585	0.41 % 0.0545
32	0.52 % 0.0966	0.16 % 0.0251	0.15 % 0.0232	0.37 % 0.0504	0.29 % 0.0388
33	0.45 % 0.0837	0.18 % 0.0281	0.19 % 0.0276	0.25 % 0.0342	0.26 % 0.0346
34	0.68 % 0.1255	0.13 % 0.0214	0.17 % 0.0249	0.55 % 0.0757	0.46 % 0.0612
35	1.07 % 0.1984	1.06 % 0.1690	1.43 % 0.2079	2.42 % 0.3337	3.65 % 0.4882
36	1.00 % 0.1855	0.23 % 0.0368	0.23 % 0.0337	0.37 % 0.0514	0.34 % 0.0456
37	0.34 % 0.0625	0.05 % 0.0075	0.05 % 0.0076	0.10 % 0.0131	0.10 % 0.0131
38	0.09 % 0.0169	0.11 % 0.0172	0.13 % 0.0189	0.15 % 0.0201	0.17 % 0.0224
39	0.09 % 0.0173	0.10 % 0.0158	0.12 % 0.0172	0.15 % 0.0206	0.17 % 0.0223
40	0.15 % 0.0275	0.18 % 0.0281	0.21 % 0.0310	0.24 % 0.0329	0.27 % 0.0359
41	0.15 % 0.0283	0.16 % 0.0256	0.19 % 0.0280	0.24 % 0.0325	0.28 % 0.0377
42	0.12 % 0.0225	0.11 % 0.0181	0.13 % 0.0186	0.18 % 0.0242	0.20 % 0.0271

AUBURN,WN, INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 65	RECEPTOR 82	RECEPTOR 81
43	0.16 % 0.0288	0.19 % 0.0295	0.22 % 0.0328	0.25 % 0.0348	0.29 % 0.0392
44	0.16 % 0.0296	0.17 % 0.0269	0.20 % 0.0294	0.26 % 0.0355	0.30 % 0.0402
45	0.16 % 0.0303	0.15 % 0.0241	0.18 % 0.0261	0.24 % 0.0328	0.27 % 0.0368
46	0.17 % 0.0309	0.13 % 0.0214	0.16 % 0.0229	0.21 % 0.0294	0.24 % 0.0325
47	0.16 % 0.0302	0.20 % 0.0310	0.24 % 0.0347	0.27 % 0.0369	0.31 % 0.0418
48	0.17 % 0.0312	0.18 % 0.0280	0.21 % 0.0309	0.27 % 0.0377	0.32 % 0.0429
49	0.17 % 0.0319	0.16 % 0.0251	0.19 % 0.0273	0.25 % 0.0347	0.29 % 0.0392
50	0.18 % 0.0325	0.14 % 0.0221	0.16 % 0.0237	0.22 % 0.0309	0.26 % 0.0343
51	0.17 % 0.0317	0.21 % 0.0326	0.25 % 0.0358	0.28 % 0.0392	0.33 % 0.0448
52	0.18 % 0.0328	0.18 % 0.0294	0.22 % 0.0325	0.29 % 0.0402	0.34 % 0.0461
53	0.18 % 0.0337	0.16 % 0.0261	0.20 % 0.0285	0.27 % 0.0368	0.31 % 0.0420
54	0.19 % 0.0344	0.14 % 0.0229	0.17 % 0.0245	0.24 % 0.0325	0.27 % 0.0357
55	0.10 % 0.0193	0.14 % 0.0228	0.18 % 0.0260	0.18 % 0.0245	0.21 % 0.0280
56	0.10 % 0.0190	0.12 % 0.0197	0.15 % 0.0223	0.17 % 0.0238	0.20 % 0.0279
57	0.11 % 0.0197	0.11 % 0.0176	0.13 % 0.0195	0.18 % 0.0244	0.21 % 0.0283
58	0.11 % 0.0203	0.10 % 0.0155	0.12 % 0.0170	0.16 % 0.0223	0.19 % 0.0256
59	0.11 % 0.0207	0.08 % 0.0135	0.10 % 0.0144	0.14 % 0.0195	0.16 % 0.0219
60	0.10 % 0.0192	0.15 % 0.0237	0.19 % 0.0271	0.18 % 0.0249	0.21 % 0.0284
61	0.11 % 0.0203	0.15 % 0.0243	0.19 % 0.0279	0.19 % 0.0261	0.22 % 0.0301
62	0.07 % 0.0129	0.09 % 0.0135	0.11 % 0.0154	0.12 % 0.0164	0.14 % 0.0191
63	0.11 % 0.0209	0.12 % 0.0185	0.14 % 0.0206	0.19 % 0.0262	0.23 % 0.0307

AUBURN,WN. INTERCEPTOR SERVICE AREA (1973 PT & AREA, REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 55	RECEPTOR 65	RECEPTOR 64	RECEPTOR 81
64	0.12 % 0.0215	0.10 % 0.0162	0.12 % 0.0178	0.17 % 0.0239	0.21 % 0.0277
65	0.12 % 0.0220	0.09 % 0.0139	0.10 % 0.0149	0.15 % 0.0206	0.17 % 0.0233
66	0.12 % 0.0231	0.18 % 0.0292	0.23 % 0.0336	0.22 % 0.0306	0.26 % 0.0351
67	0.12 % 0.0219	0.16 % 0.0260	0.21 % 0.0301	0.20 % 0.0280	0.24 % 0.0326
68	0.02 % 0.0044	0.03 % 0.0047	0.04 % 0.0058	0.04 % 0.0057	0.05 % 0.0067
69	0.09 % 0.0153	0.13 % 0.0205	0.16 % 0.0239	0.16 % 0.0215	0.19 % 0.0252
70	0.12 % 0.0226	0.18 % 0.0279	0.22 % 0.0326	0.22 % 0.0301	0.26 % 0.0356
71	0.13 % 0.0239	0.16 % 0.0254	0.20 % 0.0294	0.23 % 0.0315	0.28 % 0.0375
72	0.36 % 0.0673	0.33 % 0.0525	0.40 % 0.0586	0.53 % 0.0732	0.77 % 0.1030
73	0.39 % 0.0724	0.25 % 0.0396	0.29 % 0.0422	0.42 % 0.0588	0.49 % 0.0657
74	0.41 % 0.0766	0.37 % 0.0584	0.45 % 0.0657	0.75 % 0.1030	0.92 % 0.1231
75	0.45 % 0.0833	0.27 % 0.0422	0.31 % 0.0455	0.48 % 0.0657	0.56 % 0.0750
BACK-GRDND	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.
TOTAL	100.1 % 18.5374	100.0 % 15.8915	100.3 % 14.5829	100.3 % 13.7704	100.0 % 13.4227

SUPPLEMENT 2

AQDM Input and Output Printouts, 1990 Analysis, Auburn Interceptor Service Area

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AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

SOURCE DATA

SOURCE NUMBER	SOURCE LOCATION (KILOMETERS)		SOURCE AREA SQUARE KILOMETERS	ANNUAL SOURCE EMISSION RATE (TONS/DAY)		STACK DATA			
	HORIZONTAL	VERTICAL		SO2	PART	HT (M)	DIAM (M)	VEL (M/SEC)	TEMP (DEG.K)
1	558.0	5238.0	0.0	0.0	0.029	13.1	0.9	68.9	422.
2	559.4	5250.3	0.0	0.0	0.254	12.2	1.8	35.9	464.
3	564.4	5242.1	0.0	0.0	0.318	6.1	1.2	19.8	355.
4	570.0	5249.0	0.0	0.0	0.011	14.0	1.2	0.0	505.
5	557.3	5249.3	0.0	0.0	0.003	9.1	0.5	9.4	422.
6	555.7	5253.7	0.0	0.0	0.060	12.2	3.0	25.5	422.
7	560.4	5236.8	0.0	0.0	0.012	6.1	0.5	10.9	422.
8	553.0	5247.5	0.0	0.0	0.004	7.6	1.5	9.4	394.
9	557.5	5248.2	0.0	0.0	0.022	18.3	0.9	0.0	422.
10	557.0	5250.0	0.0	0.0	0.032	15.2	0.6	2.4	422.
11	558.5	5239.5	0.0	0.0	0.004	15.2	0.9	4.8	422.
12	557.6	5254.5	0.0	0.0	0.179	0.0	0.0	0.0	284.
13	556.0	5254.0	0.0	0.0	0.230	0.0	0.0	0.0	284.
14	560.6	5258.5	0.0	0.0	0.332	0.0	0.0	0.0	284.
15	556.5	5258.3	0.0	0.0	0.523	0.0	0.0	0.0	284.
16	562.4	5238.5	0.0	0.0	0.005	0.0	0.0	0.0	339.
17	555.7	5234.7	0.0	0.0	0.055	0.0	0.0	0.0	0.
18	557.5	5237.5	0.0	0.0	0.009	0.0	0.0	0.0	0.
19	560.5	5235.6	0.0	0.0	0.025	0.0	0.0	0.0	0.
20	554.6	5238.3	0.0	0.0	0.041	0.0	0.0	0.0	0.
21	563.5	5242.8	13.93	0.0	0.036	5.0	0.0	0.0	0.
22	555.2	5236.8	11.12	0.0	0.131	5.0	0.0	0.0	0.
23	555.4	5241.4	9.12	0.0	0.110	5.0	0.0	0.0	0.
24	555.7	5244.8	13.79	0.0	0.125	5.0	0.0	0.0	0.
25	561.1	5235.1	12.31	0.0	0.089	5.0	0.0	0.0	0.
26	565.8	5238.6	64.07	0.0	0.303	5.0	0.0	0.0	0.
27	561.5	5237.7	7.95	0.0	0.079	5.0	0.0	0.0	0.
28	561.3	5241.6	10.93	0.0	0.120	5.0	0.0	0.0	0.
29	570.9	5240.6	48.63	0.0	0.135	5.0	0.0	0.0	0.
30	570.3	5245.7	34.46	0.0	0.122	5.0	0.0	0.0	0.
31	562.0	5256.9	4.37	0.0	0.072	5.0	0.0	0.0	0.
32	565.6	5246.1	23.19	0.0	0.158	5.0	0.0	0.0	0.
33	566.4	5251.1	30.17	0.0	0.183	5.0	0.0	0.0	0.
34	561.4	5249.9	5.23	0.0	0.073	5.0	0.0	0.0	0.
35	557.4	5249.1	1.32	0.0	0.093	5.0	0.0	0.0	0.
36	562.8	5252.1	8.65	0.0	0.140	5.0	0.0	0.0	0.
37	562.0	5255.3	2.24	0.0	0.021	5.0	0.0	0.0	0.
38	556.5	5234.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
39	557.5	5234.0	1.00	0.0	0.030	5.0	0.0	0.0	0.
40	556.5	5235.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
41	557.5	5235.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
42	558.5	5235.0	1.00	0.0	0.036	5.0	0.0	0.0	0.
43	556.5	5236.0	1.00	0.0	0.036	5.0	0.0	0.0	0.
44	557.5	5236.0	1.00	0.0	0.045	5.0	0.0	0.0	0.
45	558.5	5236.0	1.00	0.0	0.046	5.0	0.0	0.0	0.

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46	557.5	5236.0	1.00	0.0	0.045	5.0	0.0	0.0	0.
47	556.5	5237.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
48	557.5	5237.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
49	558.5	5237.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
50	553.5	5237.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
51	556.5	5238.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
52	557.5	5238.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
53	558.5	5238.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
54	559.5	5238.0	1.00	0.0	0.046	5.0	0.0	0.0	0.
55	555.5	5239.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
56	556.5	5239.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
57	557.5	5239.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
58	558.5	5239.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
59	559.5	5239.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
60	554.5	5240.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
61	555.5	5240.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
62	556.5	5240.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
63	557.5	5240.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
64	558.5	5240.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
65	559.5	5240.0	1.00	0.0	0.019	5.0	0.0	0.0	0.
66	554.5	5241.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
67	555.5	5241.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
68	556.5	5241.0	1.00	0.0	0.005	5.0	0.0	0.0	0.
69	554.5	5242.0	1.00	0.0	0.014	5.0	0.0	0.0	0.
70	555.5	5242.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
71	556.5	5242.0	1.00	0.0	0.024	5.0	0.0	0.0	0.
72	559.0	5241.5	4.00	0.0	0.058	5.0	0.0	0.0	0.
73	560.0	5241.5	4.00	0.0	0.058	5.0	0.0	0.0	0.
74	558.0	5243.5	4.00	0.0	0.058	5.0	0.0	0.0	0.
75	560.0	5243.5	4.00	0.0	0.058	5.0	0.0	0.0	0.

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AUBRUN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

RECEPTOR DATA

LOCATIONS TO BE USED AS RECEPTORS IN ADDITION TO THE 221 RECTANGULAR GRID LOCATIONS

 RECEPTOR    X-COORDINATE    Y-COORDINATE
  NUMBER     (KILOMETERS)    (KILOMETERS)

   222          558.4           5242.3
   223          558.5           5239.5
   224          562.0           5259.5
   225          560.2           5256.5
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                    AUBRUN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

                METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

      MIXING DEPTH =  940. METERS
      AMBIENT TEMPERATURE =  284. DEGREES,KELVIN
      AMBIENT PRESSURE = 1013. MILLIBARS

      STABILITY CLASS  1
                                        WINDSPEED CLASS

        WIND DIRECTION       1        2        3        4        5        6

             N            0.0004   0.0008   0.0      0.0      0.0      0.0
             NNE          0.0004   0.0004   0.0      0.0      0.0      0.0
             NE           0.0004   0.0      0.0      0.0      0.0      0.0
             ENE          0.0      0.0      0.0      0.0      0.0      0.0
             E            0.0      0.0      0.0      0.0      0.0      0.0
             ESE          0.0      0.0      0.0      0.0      0.0      0.0
             SE           0.0004   0.0      0.0      0.0      0.0      0.0
             SSE          0.0      0.0      0.0      0.0      0.0      0.0
             S            0.0004   0.0004   0.0      0.0      0.0      0.0
             SSW          0.0      0.0      0.0      0.0      0.0      0.0
             SW           0.0      0.0004   0.0      0.0      0.0      0.0
             WSW          0.0004   0.0      0.0      0.0      0.0      0.0
             W            0.0      0.0004   0.0      0.0      0.0      0.0
             WNW          0.0      0.0004   0.0      0.0      0.0      0.0
             NW           0.0      0.0      0.0      0.0      0.0      0.0
             NNW          0.0      0.0012   0.0      0.0      0.0      0.0
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 2

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0033	0.0068	0.0044	0.0	0.0	0.0
NNE	0.0048	0.0024	0.0	0.0	0.0	0.0
NE	0.0020	0.0004	0.0	0.0	0.0	0.0
ENE	0.0008	0.0004	0.0	0.0	0.0	0.0
E	0.0012	0.0	0.0	0.0	0.0	0.0
ESE	0.0008	0.0	0.0	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0044	0.0004	0.0	0.0	0.0	0.0
S	0.0117	0.0020	0.0	0.0	0.0	0.0
SSW	0.0024	0.0016	0.0004	0.0	0.0	0.0
SW	0.0020	0.0016	0.0020	0.0	0.0	0.0
WSW	0.0012	0.0036	0.0004	0.0	0.0	0.0
W	0.0012	0.0020	0.0004	0.0	0.0	0.0
WNW	0.0020	0.0016	0.0	0.0	0.0	0.0
NW	0.0004	0.0016	0.0024	0.0	0.0	0.0
NNW	0.0028	0.0032	0.0008	0.0	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL PEV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 3

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0010	0.0056	0.0080	0.0008	0.0	0.0
NNE	0.0033	0.0008	0.0036	0.0004	0.0	0.0
NE	0.0008	0.0	0.0	0.0	0.0	0.0
ENE	0.0016	0.0	0.0004	0.0	0.0	0.0
E	0.0004	0.0	0.0004	0.0	0.0	0.0
ESE	0.0012	0.0	0.0008	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0025	0.0004	0.0	0.0	0.0	0.0
S	0.0100	0.0064	0.0020	0.0	0.0	0.0
SSW	0.0029	0.0020	0.0004	0.0004	0.0	0.0
SW	0.0013	0.0012	0.0052	0.0012	0.0	0.0
WSW	0.0008	0.0012	0.0036	0.0	0.0	0.0
W	0.0004	0.0016	0.0004	0.0004	0.0	0.0
WNW	0.0004	0.0008	0.0	0.0	0.0	0.0
NW	0.0000	0.0016	0.0052	0.0	0.0	0.0
NNW	0.0013	0.0024	0.0044	0.0004	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 4

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0077	0.0184	0.0172	0.0044	0.0	0.0
NNE	0.0048	0.0056	0.0035	0.0008	0.0	0.0
NE	0.0019	0.0028	0.0004	0.0	0.0	0.0
ENE	0.0037	0.0004	0.0	0.0	0.0	0.0
E	0.0025	0.0004	0.0020	0.0020	0.0	0.0
ESE	0.0018	0.0028	0.0	0.0012	0.0	0.0
SE	0.0046	0.0024	0.0004	0.0012	0.0004	0.0
SSE	0.0127	0.0076	0.0020	0.0	0.0	0.0
S	0.0349	0.0632	0.0536	0.0152	0.0024	0.0004
SSW	0.0246	0.0416	0.0364	0.0280	0.0040	0.0012
SW	0.0052	0.0196	0.0256	0.0160	0.0015	0.0
WSW	0.0041	0.0096	0.0108	0.0056	0.0	0.0
W	0.0018	0.0028	0.0028	0.0004	0.0	0.0
WNW	0.0013	0.0004	0.0004	0.0	0.0	0.0
NW	0.0030	0.0016	0.0040	0.0012	0.0	0.0
NNW	0.0061	0.0076	0.0040	0.0	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL BEV)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 5

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0251	0.0248	0.0056	0.0	0.0	0.0
NNE	0.0069	0.0056	0.0004	0.0	0.0	0.0
NE	0.0034	0.0024	0.0008	0.0	0.0	0.0
ENE	0.0023	0.0008	0.0004	0.0	0.0	0.0
E	0.0037	0.0012	0.0016	0.0	0.0	0.0
ESE	0.0019	0.0008	0.0004	0.0	0.0	0.0
SE	0.0037	0.0008	0.0004	0.0	0.0	0.0
SSE	0.0023	0.0008	0.0	0.0	0.0	0.0
S	0.0314	0.0176	0.0016	0.0	0.0	0.0
SSW	0.0205	0.0268	0.0032	0.0	0.0	0.0
SW	0.0038	0.0024	0.0	0.0	0.0	0.0
WSW	0.0025	0.0026	0.0009	0.0	0.0	0.0
W	0.0029	0.0024	0.0	0.0	0.0	0.0
WNW	0.0010	0.0012	0.0004	0.0	0.0	0.0
NW	0.0050	0.0048	0.0008	0.0	0.0	0.0
NNW	0.0162	0.0212	0.0020	0.0	0.0	0.0

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              AUBRUN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

INPUT REGRESSION PARAMETERS ARE:

   POLLUTANT__   ______Y-INTERCEPT______   __SLOPE_

  PARTICULATES           57.7                1.0000
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL SEV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
1	550.0	5230.0	0.0	58.948
2	550.0	5232.0	0.0	58.947
3	550.0	5234.0	0.0	58.957
4	550.0	5236.0	0.0	58.956
5	550.0	5238.0	0.0	58.944
6	550.0	5240.0	0.0	58.920
7	550.0	5242.0	0.0	58.907
8	550.0	5244.0	0.0	58.932
9	550.0	5246.0	0.0	58.942
10	550.0	5248.0	0.0	58.914
11	550.0	5250.0	0.0	58.925
12	550.0	5252.0	0.0	58.952
13	550.0	5254.0	0.0	59.010
14	550.0	5256.0	0.0	59.018
15	550.0	5258.0	0.0	59.073
16	550.0	5260.0	0.0	59.054
17	550.0	5262.0	0.0	59.042
18	552.0	5230.0	0.0	59.437
19	552.0	5232.0	0.0	59.469
20	552.0	5234.0	0.0	59.536
21	552.0	5236.0	0.0	59.527
22	552.0	5238.0	0.0	59.521
23	552.0	5240.0	0.0	59.600
24	552.0	5242.0	0.0	59.607
25	552.0	5244.0	0.0	59.570
26	552.0	5246.0	0.0	59.623
27	552.0	5248.0	0.0	59.699
28	552.0	5250.0	0.0	59.696
29	552.0	5252.0	0.0	59.730
30	552.0	5254.0	0.0	59.735
31	552.0	5256.0	0.0	59.700
32	552.0	5258.0	0.0	59.777
33	552.0	5260.0	0.0	59.623
34	552.0	5262.0	0.0	59.622
35	554.0	5230.0	0.0	60.254
36	554.0	5232.0	0.0	60.342
37	554.0	5234.0	0.0	60.618
38	554.0	5236.0	0.0	61.171
39	554.0	5238.0	0.0	61.307
40	[illegible]	5240.0	0.0	[illegible]

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL PEV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
41	554.0	5242.0	0.0	62.736
42	554.0	5244.0	0.0	62.120
43	554.0	5246.0	0.0	61.713
44	554.0	5248.0	0.0	61.548
45	554.0	5250.0	0.0	61.413
46	554.0	5252.0	0.0	61.111
47	554.0	5254.0	0.0	61.363
48	554.0	5256.0	0.0	60.949
49	554.0	5258.0	0.0	61.225
50	554.0	5260.0	0.0	60.933
51	554.0	5262.0	0.0	60.363
52	556.0	5230.0	0.0	61.572
53	556.0	5232.0	0.0	62.789
54	556.0	5234.0	0.0	66.393
55	556.0	5236.0	0.0	68.745
56	556.0	5238.0	0.0	67.509
57	556.0	5240.0	0.0	67.413
58	556.0	5242.0	0.0	67.552
59	556.0	5244.0	0.0	65.583
60	556.0	5246.0	0.0	64.910
61	556.0	5248.0	0.0	64.371
62	556.0	5250.0	0.0	66.525
63	556.0	5252.0	0.0	67.015
64	556.0	5254.0	0.0	63.754
65	556.0	5256.0	0.0	72.347
66	556.0	5258.0	0.0	74.097
67	556.0	5260.0	0.0	70.539
68	556.0	5262.0	0.0	65.992
69	558.0	5230.0	0.0	62.259
70	558.0	5232.0	0.0	63.213
71	558.0	5234.0	0.0	65.607
72	558.0	5236.0	0.0	70.221
73	558.0	5238.0	0.0	72.032
74	558.0	5240.0	0.0	70.005
75	558.0	5242.0	0.0	68.002
76	558.0	5244.0	0.0	67.378
77	558.0	5246.0	0.0	66.552
78	558.0	5248.0	0.0	66.775
79	558.0	5250.0	0.0	67.446
80	558.0	5252.0	0.0	67.197

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL PEV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
81	558.0	5254.0	0.0	71.885
82	558.0	5256.0	0.0	72.148
83	558.0	5258.0	0.0	66.530
84	558.0	5260.0	0.0	67.198
85	558.0	5262.0	0.0	66.396
86	560.0	5230.0	0.0	62.068
87	560.0	5232.0	0.0	62.540
88	560.0	5234.0	0.0	63.262
89	560.0	5236.0	0.0	66.139
90	560.0	5238.0	0.0	69.144
91	560.0	5240.0	0.0	68.842
92	560.0	5242.0	0.0	67.433
93	560.0	5244.0	0.0	66.946
94	560.0	5246.0	0.0	66.005
95	560.0	5248.0	0.0	65.493
96	560.0	5250.0	0.0	64.966
97	560.0	5252.0	0.0	65.133
98	560.0	5254.0	0.0	65.017
99	560.0	5256.0	0.0	65.745
100	560.0	5258.0	0.0	67.361
101	560.0	5260.0	0.0	66.268
102	560.0	5262.0	0.0	65.74[illegible]
103	562.0	5230.0	0.0	61.569
104	562.0	5232.0	0.0	61.891
105	562.0	5234.0	0.0	62.206
106	562.0	5236.0	0.0	62.375
107	562.0	5238.0	0.0	63.463
108	562.0	5240.0	0.0	63.656
109	562.0	5242.0	0.0	64.294
110	562.0	5244.0	0.0	64.950
111	562.0	5246.0	0.0	65.285
112	562.0	5248.0	0.0	64.983
113	552.0	5250.0	0.0	65.188
114	562.0	5252.0	0.0	65.031
115	562.0	5254.0	0.0	65.128
116	562.0	5256.0	0.0	65.183
117	562.0	5258.0	0.0	63.825
118	562.0	5260.0	0.0	65.199
119	562.0	5262.0	0.0	65.225
120	564.0	5230.0	0.0	61.947

AUBURN,WA, INTERCEPTOR SERVICE AREA (1990 TOTAL BPV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
121	564.0	5232.0	0.0	61.309
122	564.0	5234.0	0.0	61.367
123	564.0	5236.0	0.0	61.802
124	564.0	5238.0	0.0	62.480
125	564.0	5240.0	0.0	63.543
126	564.0	5242.0	0.0	62.500
127	564.0	5244.0	0.0	65.367
128	564.0	5246.0	0.0	64.990
129	564.0	5248.0	0.0	64.364
130	564.0	5250.0	0.0	64.076
131	564.0	5252.0	0.0	64.004
132	564.0	5254.0	0.0	63.778
133	564.0	5256.0	0.0	63.329
134	564.0	5258.0	0.0	63.023
135	564.0	5260.0	0.0	62.369
136	564.0	5262.0	0.0	62.691
137	566.0	5230.0	0.0	60.499
138	566.0	5232.0	0.0	60.491
139	566.0	5234.0	0.0	60.543
140	566.0	5236.0	0.0	61.172
141	566.0	5238.0	0.0	61.371
142	566.0	5240.0	0.0	[illegible]
143	566.0	5242.0	0.0	61.333
144	566.0	5244.0	0.0	62.766
145	566.0	5246.0	0.0	63.378
146	566.0	5248.0	0.0	63.068
147	566.0	5250.0	0.0	62.855
148	566.0	5252.0	0.0	62.720
149	566.0	5254.0	0.0	62.455
150	566.0	5256.0	0.0	62.340
151	566.0	5258.0	0.0	62.285
152	566.0	5260.0	0.0	62.264
153	566.0	5262.0	0.0	62.067
154	568.0	5230.0	0.0	60.008
155	568.0	5232.0	0.0	60.016
156	568.0	5234.0	0.0	60.103
157	568.0	5236.0	0.0	60.239
158	568.0	5238.0	0.0	60.360
159	568.0	5240.0	0.0	60.473
160	568.0	5242.0	0.0	60.512

AUBURN,WA, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS)		EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
161	568.0	5244.0	0.0	60.834
162	568.0	5246.0	0.0	61.106
163	568.0	5248.0	0.0	61.480
164	568.0	5250.0	0.0	61.675
165	568.0	5252.0	0.0	61.469
166	568.0	5254.0	0.0	61.538
167	568.0	5256.0	0.0	61.544
168	568.0	5258.0	0.0	61.593
169	568.0	5260.0	0.0	61.506
170	568.0	5262.0	0.0	61.427
171	570.0	5230.0	0.0	59.539
172	570.0	5232.0	0.0	59.608
173	570.0	5234.0	0.0	59.587
174	570.0	5236.0	0.0	59.523
175	570.0	5238.0	0.0	59.740
176	570.0	5240.0	0.0	59.777
177	570.0	5242.0	0.0	59.915
178	570.0	5244.0	0.0	60.199
179	570.0	5246.0	0.0	60.271
180	570.0	5248.0	0.0	60.768
181	570.0	5250.0	0.0	61.358
182	570.0	5252.0	0.0	60.717
183	570.0	5254.0	0.0	60.369
184	570.0	5256.0	0.0	60.934
185	570.0	5258.0	0.0	60.387
186	570.0	5260.0	0.0	60.973
187	570.0	5262.0	0.0	60.894
188	572.0	5230.0	0.0	59.306
189	572.0	5232.0	0.0	59.269
190	572.0	5234.0	0.0	59.212
191	572.0	5236.0	0.0	59.169
192	572.0	5238.0	0.0	59.286
193	572.0	5240.0	0.0	59.306
194	572.0	5242.0	0.0	59.440
195	572.0	5244.0	0.0	59.689
196	572.0	5246.0	0.0	59.670
197	572.0	5248.0	0.0	59.712
198	572.0	5250.0	0.0	59.728
199	572.0	5252.0	0.0	59.977
[illegible]	572.0	[illegible]	0.0	[illegible]

AUBRUN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL PEV)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	PARTICULATES
201	572.0	5256.0	0.0	60.308
202	572.0	5258.0	0.0	60.390
203	572.0	5260.0	0.0	60.456
204	572.0	5262.0	0.0	60.44[illegible]
205	574.0	5230.0	0.0	59.016
206	574.0	5232.0	0.0	58.949
207	574.0	5234.0	0.0	58.925
208	574.0	5236.0	0.0	58.869
209	574.0	5238.0	0.0	58.856
210	574.0	5240.0	0.0	58.99[illegible]
211	574.0	5242.0	0.0	59.058
212	574.0	5244.0	0.0	59.045
213	574.0	5246.0	0.0	59.077
214	574.0	5248.0	0.0	59,175
215	574.0	5250.0	0.0	59.281
216	574.0	5252.0	0.0	59.328
217	574.0	5254.0	0.0	59.557
218	574.0	5256.0	0.0	59.723
219	574.0	5258.0	0.0	59.876
220	574.0	5260.0	0.0	59.947
221	574.0	5262.0	0.0	59.997
222	558.8	[illegible]	0.0	67.907
223	558.5	5259.5	0.0	70.873
224	562.0	5259.5	0.0	65.352
225	560.2	5258.5	0.0	75.9[illegible]

EFFECTIVE STACK HEIGHT (IN METERS) FOR EACH SOURCE

1	45.0
2	33.8
3	17.5
4	14.0
5	10.4
6	58.2
7	8.5
8	13.0
9	18.3
10	15.6
11	17.4
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.0
20	0.0
21	5.0
22	5.0
23	5.0
24	5.0
25	5.0
26	5.0
27	5.0
28	5.0
29	5.0
30	5.0
31	5.0
32	5.0
33	5.0
34	5.0
35	5.0
36	5.0
37	5.0
38	5.0
39	5.0
40	5.0
41	5.0
42	5.0
43	5.0
44	5.0
45	5.0
46	5.0
47	5.0
48	5.0
49	5.0

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EFFECTIVE STACK HEIGHT (IN METERS) FOR EACH SOURCE

       50            5.0
       51            5.0
       52            5.0
       53            5.0
       54            5.0
       55            5.0
       56            5.0
       57            5.0
       58            5.0
       59            5.0
       60            5.0
       61            5.0
       62            5.0
       63            5.0
       64            5.0
       65            5.0
       66            5.0
       67            5.0
       68            5.0
       69            5.0
       70            5.0
       71            5.0
       72            5.0
       73            5.0
       74            5.0
       75            5.0
```

AUBURN,WA, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER,CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 65	RECEPTOR 82	RECEPTOR 73
1	0.07 %	0.07 %	0.08 %	0.11 %	[illegible]
	0.0525	0.0517	0.0602	0.0817	[illegible]
2	1.56 %	0.67 %	0.37 %	2.90 %	0.79 %
	1.1981	0.4991	0.2649	2.0930	0.5729
3	1.14 %	0.36 %	0.43 %	0.52 %	0.65 %
	0.8725	0.2692	0.3110	0.3745	0.4647
4	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %
	0.0083	0.0058	0.0054	0.0074	[illegible]
5	0.04 %	0.03 %	0.04 %	0.09 %	0.03 %
	0.0293	0.0234	0.0257	0.0657	0.0221
6	0.10 %	0.39 %	0.52 %	0.26 %	0.04 %
	0.0792	0.2914	0.3822	0.1894	0.0299
7	0.07 %	0.05 %	0.05 %	0.08 %	0.09 %
	0.0520	0.0337	0.0353	0.0558	0.0628
8	0.02 %	0.05 %	0.06 %	0.04 %	0.02 %
	0.0159	0.0381	0.0470	0.0321	0.0174
9	0.26 %	0.28 %	0.35 %	0.59 %	0.24 %
	0.2025	0.2064	0.2578	0.4262	0.1751
10	0.01 %	0.08 %	0.05 %	0.09 %	0.01 %
	0.0097	0.0572	0.0361	0.0670	0.0077
11	0.03 %	0.03 %	0.03 %	0.04 %	0.26 %
	0.0208	0.0187	0.0217	0.0324	0.1966
12	3.58 %	2.01 %	2.78 %	48.29 %	1.17 %
	2.7554	1.4888	2.0251	34.8428	0.8426
13	1.48 %	14.24 %	48.12 %	5.84 %	1.45 %
	1.1399	10.5222	35.0225	4.2169	1.0742
14	70.47 %	1.24 %	1.07 %	1.82 %	1.39 %
	54.1868	0.9196	0.7811	1.3135	1.0039
15	2.29 %	64.59 %	27.03 %	14.72 %	2.65 %
	1.7611	47.8627	12.6888	10.6230	1.9115
16	0.03 %	0.01 %	0.01 %	0.03 %	0.02 %
	0.0212	0.0089	0.0075	0.0184	0.0179
17	0.26 %	0.34 %	0.41 %	0.41 %	1.70 %
	0.1962	0.2544	0.3002	0.2970	1.2318
18	0.05 %	0.06 %	0.07 %	0.08 %	2.58 %
	0.0325	0.0424	0.0502	0.0521	1.8606
19	0.13 %	0.09 %	0.10 %	0.15 %	0.18 %
	0.1045	0.0692	0.0751	0.1112	0.1269
20	0.25 %	0.19 %	0.22 %	0.33 %	0.92 %
	0.1943	0.1429	0.1602	0.2345	0.6625
21	0.29 %	0.23 %	0.26 %	0.33 %	0.36 %
	0.2205	0.1720	0.1221	0.2425	0.2604

AUGUSTA,WV, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 65	RECEPTOR 82	RECEPTOR 73
22	0.61 % 0.4657	0.83 % 0.6175	1.00 % 0.7248	0.97 % 0.7026	1.42 % 1.0193
23	0.65 % 0.5040	0.92 % 0.6791	1.13 % 0.9267	1.06 % 0.7322	1.04 % 0.7515
24	0.71 % 0.7033	1.28 % 0.9511	1.63 % 1.1871	1.59 % 1.1469	1.17 % 0.8159
25	0.36 % 0.2756	0.27 % 0.1282	0.30 % 0.2215	0.40 % 0.2852	0.51 % [illegible]
26	0.86 % 0.6580	0.63 % 0.4601	0.66 % 0.4822	0.87 % 0.6302	0.34 % 0.2475
27	0.36 % 0.2720	0.25 % 0.1850	0.28 % 0.2068	0.39 % 0.2797	0.29 % 0.2088
28	0.74 % 0.5667	0.45 % 0.3239	0.48 % 0.3232	0.76 % 0.5502	0.61 % 0.4277
29	0.30 % 0.2304	0.14 % 0.1003	0.16 % 0.1153	0.19 % 0.1341	0.17 % 0.1255
30	0.15 % 0.1107	0.10 % 0.0719	0.10 % 0.0758	0.13 % 0.0940	0.14 % 0.0978
31	0.52 % 0.3983	0.17 % 0.1232	0.15 % 0.1122	0.50 % 0.3598	0.35 % 0.2522
32	0.60 % 0.4579	0.18 % 0.1343	0.22 % 0.1605	0.41 % 0.2979	0.31 % 0.2233
33	0.49 % 0.3786	0.20 % 0.1443	0.21 % 0.1501	0.27 % 0.1925	0.41 % 0.2937
34	0.84 % 0.6361	0.17 % 0.1242	0.21 % 0.1533	0.67 % 0.4792	0.37 % 0.2671
35	1.17 % 0.8925	1.17 % 0.8644	1.55 % 1.1319	2.61 % 1.8858	0.87 % 0.6229
36	1.20 % 0.9211	0.28 % 0.2061	0.28 % 0.2008	0.44 % 0.3183	0.52 % 0.3794
37	0.34 % 0.2584	0.05 % 0.0351	0.05 % 0.0379	0.09 % 0.0678	0.08 % 0.0567
38	0.14 % 0.1055	0.16 % 0.1212	0.19 % 0.1412	0.22 % 0.1561	1.43 % 1.0322
39	0.14 % 0.1082	0.15 % 0.1112	0.18 % 0.1289	0.22 % 0.1587	1.62 % 1.1704
40	0.22 % 0.1709	0.27 % 0.1959	0.32 % 0.2317	0.35 % 0.2521	2.63 % 1.8947
41	0.23 % 0.1757	0.24 % 0.1796	0.29 % 0.2091	0.36 % 0.2590	3.54 % 2.5491
42	0.18 % 0.1402	0.17 % 0.1270	0.20 % 0.1462	0.26 % 0.1879	2.24 % 1.6116

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 65	RECEPTOR 82	RECEPTOR 73
43	0.23 % 0.1752	0.28 % 0.2067	0.34 % 0.2545	0.37 % 0.2526	2.70 % 1.9930
44	0.24 % 0.1882	0.25 % 0.1877	0.30 % 0.2192	0.38 % 0.2750	4.83 % 3.4838
45	0.25 % 0.1685	0.23 % 0.1690	0.27 % 0.1951	0.35 % 0.2539	3.73 % 2.6894
46	0.25 % 0.1915	0.20 % 0.1500	0.23 % 0.1706	0.32 % 0.2276	1.23 % 0.8856
47	0.24 % 0.1876	0.29 % 0.2176	0.35 % 0.2548	0.40 % 0.2857	2.24 % 1.6167
48	0.25 % 0.1925	0.27 % 0.1964	0.32 % 0.2303	0.40 % 0.2920	8.43 % 6.0743
49	0.26 % 0.1925	0.24 % 0.1772	0.28 % 0.2035	0.37 % 0.2697	6.34 % 4.5650
50	0.26 % 0.2024	0.21 % 0.1550	0.24 % 0.1755	0.33 % 0.2390	0.82 % 0.5884
51	0.25 % 0.1973	0.31 % 0.2257	0.39 % 0.2748	0.42 % 0.3037	1.20 % 0.8619
52	0.27 % [illegible]	0.28 % 0.2058	0.33 % 0.2424	0.43 % 0.3111	11.05 % [illegible]
53	0.27 % 0.2079	0.25 % 0.1833	0.29 % 0.2127	0.40 % 0.2853	9.91 % 7.1526
54	0.28 % 0.2125	0.22 % 0.1603	0.25 % 0.1825	0.35 % 0.2517	0.89 % 0.6433
55	0.14 % 0.1065	0.19 % 0.1352	0.23 % 0.1687	0.23 % 0.1650	0.18 % 0.1308
56	0.11 % 0.0855	0.14 % 0.1007	0.17 % 0.1213	0.19 % 0.1362	0.41 % 0.2946
57	0.12 % 0.0892	0.12 % 0.0896	0.15 % 0.1060	0.19 % 0.1373	1.70 % 1.2261
58	0.12 % 0.0918	0.11 % 0.0792	0.13 % 0.0922	0.17 % 0.1259	[illegible] 1.0997
59	0.12 % 0.0887	0.09 % 0.0637	0.11 % 0.0782	0.15 % 0.1100	0.32 % 0.2340
60	0.13 % 0.1026	0.20 % 0.1467	0.24 % 0.1760	0.23 % 0.1679	0.11 % 0.0779
61	0.14 % 0.1072	0.20 % 0.1482	0.25 % 0.1811	0.24 % 0.1761	0.26 % 0.1893
62	0.09 % 0.0687	0.11 % 0.0810	0.13 % 0.0942	0.15 % 0.1126	0.36 % 0.2559
63	0.12 % 0.0944	0.13 % 0.0943	0.15 % 0.1122	0.21 % 0.1479	0.87 % 0.6286

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 TOTAL REV)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 225	RECEPTOR 66	RECEPTOR 65	RECEPTOR 82	RECEPTOR 73
64	0.13 % 0.0775	0.11 % 0.0828	0.13 % 0.0956	0.19 % 0.1346	0.77 % 0.5527
65	0.13 % 0.0996	0.10 % 0.0710	0.11 % 0.0809	0.16 % 0.1164	0.34 % 0.2481
66	0.16 % 0.1243	0.24 % 0.1769	0.30 % 0.2166	0.28 % 0.2051	0.19 % 0.1391
67	0.15 % 0.1156	0.21 % 0.1525	0.27 % 0.1994	0.26 % 0.1907	0.30 % 0.2131
68	0.03 % 0.0233	0.04 % 0.0277	0.05 % 0.0338	0.05 % 0.0375	0.12 % 0.0857
69	0.11 % 0.0855	0.17 % 0.1244	0.21 % 0.1532	0.20 % 0.1441	0.15 % 0.1092
70	0.16 % 0.1219	0.23 % 0.1702	0.29 % 0.2119	0.28 % 0.2029	0.29 % 0.2098
71	0.17 % 0.1293	0.21 % 0.1549	0.26 % 0.1911	0.29 % 0.2122	0.55 % 0.3955
72	0.39 % 0.3028	0.36 % 0.2665	0.43 % 0.3155	0.68 % 0.4894	1.28 % 0.9239
73	0.42 % 0.3258	0.27 % 0.2011	0.31 % 0.2281	0.45 % 0.3275	0.64 % 0.4605
74	0.45 % 0.3447	0.40 % 0.2963	0.49 % 0.3548	0.80 % 0.5780	1.05 % 0.7549
75	0.49 % 0.3751	0.29 % 0.2143	0.34 % 0.2461	0.51 % 0.3693	0.62 % 0.4467
BACK-GROUND	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.
TOTAL	100.1 % 76.9599	100.0 % 74.1136	100.0 % 72.8457	100.0 % 72.1543	100.0 % 72.0404

SUPPLEMENT 3

AQDM Input and Output Printouts,
1990 Analysis
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

SOURCE DATA

SOURCE NUMBER	SOURCE LOCATION (KILOMETERS) HORIZONTAL	SOURCE LOCATION (KILOMETERS) VERTICAL	SOURCE AREA SQUARE KILOMETERS	ANNUAL SOURCE EMISSION RATE (TONS/DAY) SO2	ANNUAL SOURCE EMISSION RATE (TONS/DAY) PART	STACK DATA HT (M)	STACK DATA DIAM (M)	STACK DATA VEL (M/SEC)	STACK DATA TEMP (DEG.K)
1	562.5	5232.8	16.98	0.0	0.121	5.0	0.0	0.0	0.
2	556.2	5236.8	11.12	0.0	0.023	5.0	0.0	0.0	0.
3	555.2	5241.4	9.12	0.0	0.018	5.0	0.0	0.0	0.
4	555.7	5244.6	13.73	0.0	0.010	5.0	0.0	0.0	0.
5	561.9	5235.1	12.31	0.0	0.029	5.0	0.0	0.0	0.
6	565.3	5238.6	64.07	0.0	0.006	5.0	0.0	0.0	0.
7	561.7	5237.7	7.95	0.0	0.004	5.0	0.0	0.0	0.
8	561.9	5243.6	10.93	0.0	0.020	5.0	0.0	0.0	0.
9	570.9	5200.6	[illegible]	0.0	0.009	5.0	0.0	0.0	0.
10	570.2	5245.7	30.45	0.0	-0.013	5.0	0.0	0.0	0.
11	562.0	5246.9	4.37	0.0	0.013	5.0	0.0	0.0	0.
12	565.6	5206.1	23.13	0.0	0.024	5.0	0.0	0.0	0.
13	565.4	5251.1	30.77	0.0	0.021	5.0	0.0	0.0	0.
14	561.4	5249.9	5.23	0.0	[illegible]	5.0	0.0	0.0	0.
15	557.9	5250.1	1.32	0.0	0.011	5.0	0.0	0.0	0.
16	562.9	5253.1	8.65	0.0	0.027	5.0	0.0	0.0	0.
17	562.0	5255.3	2.24	0.0	0.001	5.0	0.0	0.0	0.
18	556.5	5234.0	1.00	0.0	0.011	5.0	0.0	0.0	0.
19	557.5	5234.0	1.00	0.0	0.011	5.0	0.0	0.0	0.
20	555.5	5235.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
21	557.5	5235.0	1.00	0.0	0.016	5.0	0.0	0.0	0.
22	559.5	5235.0	1.00	0.0	0.013	5.0	0.0	0.0	0.
23	556.5	5236.0	1.00	0.0	0.016	5.0	0.0	0.0	0.
24	557.5	5236.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
25	559.5	5236.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
26	555.5	5236.0	1.00	0.0	0.016	5.0	0.0	0.0	0.
27	556.5	5237.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
28	557.5	5237.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
29	558.5	5237.0	1.00	0.0	0.016	5.0	0.0	0.0	0.
30	559.5	5237.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
31	556.5	5238.0	1.00	0.0	0.016	5.0	0.0	0.0	0.
32	557.5	5238.0	1.00	0.0	0.016	5.0	0.0	0.0	0.
33	558.5	5238.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
34	559.5	5238.0	1.00	0.0	0.015	5.0	0.0	0.0	0.
35	555.5	5239.0	1.00	0.0	0.006	5.0	0.0	0.0	0.
36	556.5	5239.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
37	557.5	5239.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
38	558.5	5239.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
39	559.5	5239.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
40	554.5	5240.0	1.00	0.0	0.005	5.0	0.0	0.0	0.
41	555.5	5240.0	1.00	0.0	0.006	5.0	0.0	0.0	0.
42	556.5	5240.0	1.00	0.0	0.004	5.0	0.0	0.0	0.
43	557.5	5240.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
44	558.5	5240.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
45	559.5	5240.0	1.00	0.0	0.002	5.0	0.0	0.0	0.
46	554.5	5241.0	1.00	0.0	0.007	5.0	0.0	0.0	0.
47	555.5	5241.0	1.00	0.0	0.006	5.0	0.0	0.0	0.
48	556.5	5241.0	1.00	0.0	0.001	5.0	0.0	0.0	0.
49	554.5	5242.0	1.00	0.0	0.005	5.0	0.0	0.0	0.
50	555.5	5242.0	1.00	0.0	0.006	5.0	0.0	0.0	0.
51	556.5	5242.0	1.00	0.0	0.006	5.0	0.0	0.0	0.
52	559.0	5241.5	4.00	0.0	0.005	5.0	0.0	0.0	0.
53	560.0	5241.5	4.00	0.0	0.006	5.0	0.0	0.0	0.
54	559.0	5243.5	4.00	0.0	0.005	5.0	0.0	0.0	0.
55	560.0	5243.5	4.00	0.0	0.005	5.0	0.0	0.0	0.

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

RECEPTOR DATA

LOCATIONS TO BE USED AS RECEPTORS IN ADDITION TO THE 50 RECTANGULAR GRID LOCATIONS

RECEPTOR NUMBER	X-COORDINATE (KILOMETERS)	Y-COORDINATE (KILOMETERS)
51	564.5	5275.0
52	550.4	5273.6
53	550.3	5272.1
54	550.6	5263.0
55	554.5	5265.2
56	554.8	5267.7
57	542.8	5233.3
58	542.1	5233.6
59	542.1	5233.4
60	545.0	5230.4
61	545.3	5231.4
62	549.0	5231.7

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 2

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0031	0.0068	0.0044	0.0	0.0	0.0
NNE	0.0040	0.0024	0.0	0.0	0.0	0.0
NE	0.0020	0.0004	0.0	0.0	0.0	0.0
ENE	0.0008	0.0004	0.0	0.0	0.0	0.0
E	0.0012	0.0	0.0	0.0	0.0	0.0
ESE	0.0008	0.0	0.0	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0044	0.0008	0.0	0.0	0.0	0.0
S	0.0117	0.0020	0.0	0.0	0.0	0.0
SSW	0.0024	0.0016	0.0004	0.0	0.0	0.0
SW	0.0020	0.0016	0.0020	0.0	0.0	0.0
WSW	0.0012	0.0036	0.0004	0.0	0.0	0.0
W	0.0012	0.0020	0.0004	0.0	0.0	0.0
WNW	0.0020	0.0016	0.0	0.0	0.0	0.0
NW	0.0004	0.0016	0.0024	0.0	0.0	0.0
NNW	0.0028	0.0032	0.0008	0.0	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

MIXING DEPTH = 940. METERS
AMBIENT TEMPERATURE = 284. DEGREES,KELVIN
AMBIENT PRESSURE = 1013. MILLIBARS

STABILITY CLASS 1

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0004	0.0004	0.0	0.0	0.0	0.0
NNE	0.0004	0.0004	0.0	0.0	0.0	0.0
NE	0.0004	0.0	0.0	0.0	0.0	0.0
ENE	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0004	0.0004	0.0	0.0	0.0	0.0
SSW	0.0	0.0	0.0	0.0	0.0	0.0
SW	0.0	0.0004	0.0	0.0	0.0	0.0
WSW	0.0004	0.0	0.0	0.0	0.0	0.0
W	0.0	0.0004	0.0	0.0	0.0	0.0
WNW	0.0	0.0004	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0012	0.0	0.0	0.0	0.0

AUBURN,ME, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 3

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0010	0.0056	0.0080	0.0008	0.0	0.0
NNE	0.0033	0.0008	0.0076	0.0004	0.0	0.0
NE	0.0008	0.0	0.0	0.0	0.0	0.0
ENE	0.0016	0.0	0.0004	0.0	0.0	0.0
E	0.0004	0.0	0.0008	0.0	0.0	0.0
ESE	0.0012	0.0	0.0008	0.0	0.0	0.0
SE	0.0004	0.0	0.0	0.0	0.0	0.0
SSE	0.0025	0.0004	0.0	0.0	0.0	0.0
S	0.0100	0.0064	0.0020	0.0	0.0	0.0
SSW	0.0029	0.0020	0.0004	0.0004	0.0	0.0
SW	0.0013	0.0012	0.0052	0.0012	0.0	0.0
WSW	0.0008	0.0012	0.0036	0.0	0.0	0.0
W	0.0004	0.0016	0.0004	0.0004	0.0	0.0
WNW	0.0004	0.0004	0.0	0.0	0.0	0.0
NW	0.0000	0.0016	0.0052	0.0	0.0	0.0
NNW	0.0013	0.0024	0.0044	0.0004	0.0	0.0

AUBURN, WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 4

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0077	0.0184	0.0172	0.0044	0.0	0.0
NNE	0.0048	0.0056	0.0036	0.0008	0.0	0.0
NE	0.0018	0.0026	0.0004	0.0	0.0	0.0
ENE	0.0037	0.0004	0.0	0.0	0.0	0.0
E	0.0025	0.0004	0.0020	0.0020	0.0	0.0
ESE	0.0018	0.0026	0.0	0.0012	0.0	0.0
SE	0.0046	0.0074	0.0004	0.0012	0.0004	0.0
SSE	0.0127	0.0376	0.0020	0.0	0.0	0.0
S	0.0349	0.0632	0.0536	0.0152	0.0024	0.0004
SSW	0.0246	0.0416	0.0364	0.0280	0.0040	0.0012
SW	0.0052	0.0192	0.0256	0.0160	0.0016	0.0
WSW	0.0041	0.0096	0.0108	0.0056	0.0	0.0
W	0.0018	0.0028	0.0028	0.0004	0.0	0.0
WNW	0.0013	0.0004	0.0004	0.0	0.0	0.0
NW	0.0030	0.0016	0.0040	0.0012	0.0	0.0
NNW	0.0061	0.0076	0.0040	0.0	0.0	0.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

STABILITY CLASS 5

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0251	0.0248	0.0056	0.0	0.0	0.0
NNE	0.0069	0.0056	0.0004	0.0	0.0	0.0
NE	0.0034	0.0024	0.0008	0.0	0.0	0.0
ENE	0.0023	0.0008	0.0004	0.0	0.0	0.0
E	0.0037	0.0012	0.0076	0.0	0.0	0.0
ESE	0.0019	0.0008	0.0004	0.0	0.0	0.0
SE	0.0037	0.0008	0.0004	0.0	0.0	0.0
SSE	0.0023	0.0008	0.0	0.0	0.0	0.0
S	0.0314	0.0176	0.0016	0.0	0.0	0.0
SSW	0.0205	0.0268	0.0032	0.0	0.0	0.0
SW	0.0038	0.0024	0.0	0.0	0.0	0.0
WSW	0.0025	0.0028	0.0008	0.0	0.0	0.0
W	0.0025	0.0024	0.0	0.0	0.0	0.0
WNW	0.0010	0.0072	0.0004	0.0	0.0	0.0
NW	0.0050	0.0048	0.0008	0.0	0.0	0.0
NNW	0.0162	0.0212	0.0020	0.0	0.0	0.0

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                              AUBURN,WA, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

     INPUT REGRESSION PARAMETERS ARE:

      POLLUTANT__    ______Y-INTERCEPT______    __SLOPE_

      PARTICULATES            0.0                1.0000
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AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

RECEPTOR CONCENTRATION DATA				
RECEPTOR NUMBER	RECEPTOR LOCATION		EXPECTED ARITHMETIC MEAN	
	(KILOMETERS)		(MICROGRAMS/CU. METER)	
	HORIZ	VERT	SO2	PARTICULATES
1	550.0	5230.0	0.0	0.153
2	550.0	5232.0	0.0	0.153
3	550.0	5234.0	0.0	0.159
4	550.0	5236.0	0.0	0.159
5	550.0	5238.0	0.0	0.156
6	550.0	5240.0	0.0	0.150
7	550.0	5242.0	0.0	0.150
8	550.0	5244.0	0.0	0.154
9	550.0	5246.0	0.0	0.158
10	550.0	5248.0	0.0	0.154
11	552.0	5230.0	0.0	0.230
12	552.0	5232.0	0.0	0.234
13	552.0	5234.0	0.0	0.245
14	552.0	5236.0	0.0	0.246
15	552.0	5238.0	0.0	0.238
16	552.0	5240.0	0.0	0.247
17	552.0	5242.0	0.0	0.248
18	552.0	5244.0	0.0	0.250
19	552.0	5246.0	0.0	0.258
20	552.0	5248.0	0.0	0.274
21	554.0	5230.0	0.0	0.383
22	554.0	5232.0	0.0	0.398
23	554.0	5234.0	0.0	0.433
24	554.0	5236.0	0.0	0.541
25	554.0	5238.0	0.0	0.969
26	554.0	5240.0	0.0	0.779
27	554.0	5242.0	0.0	0.995
28	554.0	5244.0	0.0	0.710
29	554.0	5246.0	0.0	0.609
30	554.0	5248.0	0.0	0.554
31	556.0	5230.0	0.0	0.659
32	556.0	5232.0	0.0	0.825
33	556.0	5234.0	0.0	1.356
34	556.0	5236.0	0.0	2.012
35	556.0	5238.0	0.0	2.215
36	556.0	5240.0	0.0	2.026
37	556.0	5242.0	0.0	1.786
38	556.0	5244.0	0.0	1.408
39	556.0	5246.0	0.0	1.118
40	556.0	5248.0	0.0	0.718

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

RECEPTOR CONCENTRATION DATA

RECEPTOR NUMBER	RECEPTOR LOCATION (KILOMETERS) HORIZ	RECEPTOR LOCATION (KILOMETERS) VERT	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) SO2	EXPECTED ARITHMETIC MEAN (MICROGRAMS/CU. METER) PARTICULATES
41	558.0	5230.0	0.0	0.852
42	558.0	5232.0	0.0	1.128
43	558.0	5234.0	0.0	1.308
44	558.0	5236.0	0.0	3.360
45	558.0	5238.0	0.0	3.734
46	558.0	5240.0	0.0	2.568
47	558.0	5242.0	0.0	1.920
48	558.0	5244.0	0.0	1.619
49	558.0	5246.0	0.0	1.327
50	558.0	5248.0	0.0	1.181
51	560.5	5275.0	0.0	0.346
52	560.4	5277.6	0.0	0.355
53	550.3	5272.1	0.0	0.185
54	550.6	5262.0	0.0	0.198
55	554.5	5266.2	0.0	0.325
56	554.8	5267.7	0.0	0.323
57	542.8	5233.3	0.0	0.072
58	542.1	5233.4	0.0	0.068
59	542.1	5233.4	0.0	0.058
60	545.0	5234.4	0.0	0.088
61	545.3	5231.4	0.0	0.084
62	547.0	5231.7	0.0	0.130

```
EFFECTIVE STACK HEIGHT (IN METERS) FOR EACH SOURCE

          1           5.0
          2           5.0
          3           5.0
          4           5.0
          5           5.0
          6           5.0
          7           5.0
          8           5.0
          9           5.0
         10           5.0
         11           5.0
         12           5.0
         13           5.0
         14           5.0
         15           5.0
         16           5.0
         17           5.0
         18           5.0
         19           5.0
         20           5.0
         21           5.0
         22           5.0
         23           5.0
         24           5.0
         25           5.0
         26           5.0
         27           5.0
         28           5.0
         29           5.0
         30           5.0
         31           5.0
         32           5.0
         33           5.0
         34           5.0
         35           5.0
         36           5.0
         37           5.0
         38           5.0
         39           5.0
         40           5.0
         41           5.0
         42           5.0
         43           5.0
         44           5.0
         45           5.0
         46           5.0
         47           5.0
         48           5.0
         49           5.0
```

EFFECTIVE STACK HEIGHT (IN METERS) FOR EACH SOURCE

50	5.0
51	5.0
52	5.0
53	5.0
54	5.0
55	5.0

AUBURN,WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 45	RECEPTOR 44	RECEPTOR 46	RECEPTOR 35	RECEPTOR 36
1	0.30 % 0.0113	0.21 % 0.0072	0.50 % 0.0129	0.25 % 0.0055	0.27 % 0.0055
2	0.96 % 0.0360	0.54 % 0.0183	2.33 % 0.0598	5.62 % 0.1288	4.47 % 0.0906
3	0.67 % 0.0250	0.80 % 0.0268	0.67 % 0.0171	1.75 % 0.0388	3.86 % 0.0782
4	0.35 % 0.0130	0.36 % 0.0120	0.53 % 0.0135	0.66 % 0.0146	0.80 % 0.0162
5	0.62 % 0.0232	0.45 % 0.0150	1.07 % 0.0275	0.45 % 0.0099	0.50 % 0.0102
6	0.03 % 0.0009	0.03 % 0.0011	0.04 % 0.0011	0.04 % 0.0009	0.05 % 0.0009
7	0.06 % 0.0023	0.07 % 0.0025	0.13 % 0.0032	0.07 % 0.0016	0.08 % 0.0016
8	0.40 % 0.0149	0.47 % 0.0159	0.53 % 0.0137	0.34 % 0.0074	0.36 % 0.0074
9	0.01 % 0.0005	0.02 % 0.0005	0.02 % 0.0005	0.02 % 0.0005	0.02 % 0.0005
10	-0.06 % -0.0021	-0.07 % -0.0022	-0.08 % -0.0020	-0.08 % -0.0017	-0.09 % -0.0018
11	0.27 % 0.0101	0.28 % 0.0095	0.37 % 0.0095	0.19 % 0.0043	0.25 % 0.0050
12	0.18 % 0.0069	0.24 % 0.0081	0.24 % 0.0062	0.24 % 0.0052	0.25 % 0.0051
13	0.19 % 0.0066	0.20 % 0.0068	0.24 % 0.0061	0.18 % 0.0041	0.20 % 0.0041
14	0.31 % 0.0116	0.31 % 0.0105	0.51 % 0.0132	0.37 % 0.0083	0.37 % 0.0074
15	0.39 % 0.0145	0.36 % 0.0122	0.69 % 0.0177	0.52 % 0.0116	0.67 % 0.0136
16	0.38 % 0.0143	0.39 % 0.0132	0.61 % 0.0156	0.49 % 0.0108	0.50 % 0.0101
17	0.01 % 0.0003	0.01 % 0.0003	0.01 % 0.0004	0.01 % 0.0003	0.01 % 0.0003
18	1.97 % 0.0734	2.65 % 0.0692	1.82 % 0.0467	3.11 % 0.0689	2.19 % 0.0444
19	2.23 % 0.0833	4.75 % 0.1597	2.04 % 0.0526	1.80 % 0.0398	1.45 % 0.0295
20	3.58 % 0.1338	3.40 % 0.1141	3.44 % 0.0882	6.58 % 0.1457	4.10 % 0.0832
21	4.82 % 0.1800	12.76 % 0.4289	3.37 % 0.0333	3.10 % 0.0688	2.57 % 0.0521

AUBURN, WN, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 45	RECEPTOR 44	RECEPTOR 46	RECEPTOR 35	RECEPTOR 36
22	3.06 % 0.1141	7.51 % 0.2525	2.54 % 0.0652	0.72 % 0.0159	1.03 % 0.0209
23	3.67 % 0.1372	1.81 % 0.0609	4.40 % 0.1130	8.57 % 0.1898	5.23 % 0.1060
24	6.58 % 0.2458	16.73 % 0.5622	4.99 % 0.1281	2.82 % 0.0625	3.02 % 0.0613
25	5.08 % 0.1898	15.03 % 0.5050	4.13 % 0.1060	0.96 % 0.0213	0.94 % 0.0191
26	1.67 % 0.0625	1.35 % 0.0454	2.39 % 0.0613	0.50 % 0.0112	0.65 % 0.0132
27	3.06 % 0.1141	1.49 % 0.0502	5.21 % 0.1338	14.55 % 0.3223	7.18 % 0.1457
28	11.49 % 0.4285	6.22 % 0.2090	7.01 % 0.1800	1.88 % 0.0415	3.39 % 0.0688
29	8.63 % 0.3223	5.58 % 0.1875	5.67 % 0.1457	0.89 % 0.0196	1.00 % 0.0203
30	1.11 % 0.0415	1.19 % 0.0399	2.68 % 0.0688	0.55 % 0.0123	0.64 % 0.0131
31	1.63 % 0.0609	1.71 % 0.0576	5.34 % 0.1372	22.80 % 0.5050	9.36 % 0.1898
32	15.06 % 0.5622	3.19 % 0.1072	9.57 % 0.2456	2.05 % 0.0454	3.08 % 0.0625
33	13.53 % 0.5050	2.80 % 0.0942	7.39 % 0.1898	0.93 % 0.0207	1.05 % 0.0213
34	1.22 % 0.0454	1.26 % 0.0423	2.44 % 0.0625	0.67 % 0.0148	0.55 % 0.0112
35	0.18 % 0.0067	0.33 % 0.0110	0.60 % 0.0153	3.62 % 0.0801	8.11 % 0.1644
36	0.18 % 0.0067	0.24 % 0.0080	0.59 % 0.0152	1.13 % 0.0250	2.12 % 0.0430
37	0.75 % 0.0279	0.33 % 0.0112	2.23 % 0.0572	0.24 % 0.0053	0.27 % 0.0055
38	0.67 % 0.0250	0.30 % 0.0100	1.67 % 0.0430	0.12 % 0.0028	0.13 % 0.0026
39	0.14 % 0.0053	0.17 % 0.0057	0.22 % 0.0055	0.08 % 0.0018	0.08 % 0.0016
40	0.11 % 0.0040	0.22 % 0.0075	0.24 % 0.0063	1.00 % 0.0221	1.15 % 0.0233
41	0.26 % 0.0097	0.32 % 0.0107	0.35 % 0.0091	1.85 % 0.0411	10.63 % 0.2155
42	0.33 % 0.0125	0.34 % 0.0115	0.51 % 0.0132	0.92 % 0.0204	5.40 % 0.1094

AUBURN,WA, INTERCEPTOR SERVICE AREA (1990 DELTA AREA ONLY)

SOURCE CONTRIBUTIONS TO FIVE MAXIMUM RECEPTORS

ANNUAL PARTICULATES

MICROGRAMS PER CUBIC METER

SOURCE	RECEPTOR 45	RECEPTOR 44	RECEPTOR 46	RECEPTOR 35	RECEPTOR 36
43	0.38 % 0.0143	0.25 % 0.0083	2.92 % 0.0750	0.25 % 0.0056	0.30 % 0.0061
44	0.34 % 0.0126	0.22 % 0.0075	2.62 % 0.0673	0.12 % 0.0026	0.14 % 0.0028
45	0.15 % 0.0056	0.15 % 0.0051	0.24 % 0.0061	0.07 % 0.0015	0.10 % 0.0020
46	0.19 % 0.0070	0.25 % 0.0083	0.18 % 0.0046	1.13 % 0.0251	1.07 % 0.0218
47	0.29 % 0.0110	0.36 % 0.0121	0.26 % 0.0067	1.45 % 0.0321	3.95 % 0.0801
48	0.11 % 0.0040	0.09 % 0.0029	0.13 % 0.0033	0.23 % 0.0050	0.62 % 0.0125
49	0.15 % 0.0055	0.16 % 0.0053	0.12 % 0.0030	0.68 % 0.0150	0.80 % 0.0163
50	0.29 % 0.0107	0.37 % 0.0124	0.38 % 0.0097	1.08 % 0.0239	2.03 % 0.0411
51	0.54 % 0.0203	0.41 % 0.0139	0.86 % 0.0221	0.97 % 0.0215	1.73 % 0.0351
52	0.54 % 0.0201	0.49 % 0.0164	1.03 % 0.0264	0.45 % 0.0100	0.49 % 0.0099
53	0.27 % 0.0100	0.29 % 0.0097	0.39 % 0.0099	0.18 % 0.0039	0.18 % 0.0036
54	0.44 % 0.0164	0.37 % 0.0125	0.78 % 0.0201	0.44 % 0.0097	0.49 % 0.0100
55	0.26 % 0.0097	0.23 % 0.0078	0.39 % 0.0100	0.17 % 0.0038	0.19 % 0.0039
BACK-GROUND	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.	0.0 % 0.
TOTAL	100.0 % 3.7348	100.0 % 3.3613	100.0 % 2.5687	100.0 % 2.2156	100.0 % 2.0286

AIR QUALITY IMPACT ASSESSMENT OF THE AUBURN INTERCEPTOR SERVICE AREA

APPENDIX C

THE DEVELOPMENT OF PARTICULATE EMISSION PROJECTIONS AND SMALL AREA PROJECTIONS

March 31, 1975

Prepared for

Research Triangle Institute
Research Triangle Park, North Carolina

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I. INTRODUCTION

The analysis described here is a projection of the particulate emissions anticipated from growth and urbanization in the proposed service area of the Auburn Interceptor.

Construction of the Auburn Interceptor represents implementation of a proposed element of METRO's Comprehensive Plan and is a portion of the second phase of the ultimate development of an areawide waste water treatment system serving the total sewerage needs of the Green River Sewerage Area and a portion of the White River Watershed.

The proposed Interceptor will be a 42- to 72-inch reinforced concrete pipe totaling 7.1 miles in length. The pipe will commence at the influent structure of the existing City of Auburn sewage lagoon and connect with the existing Metro-Kent Cross Valley Interceptor.

The sewerage area to be served by the Interceptor encompasses the Green River Sewerage Area and part of the White River Watershed. Included within this area is all of the Lower Green River Valley in the vicinity of the cities of Kent, Auburn, Algona and Pacific, and Des Moines Plateau (West Hill) to the west. The area to be served by the Interceptor in the White River Watershed lies north of Lake Tapps and within both King and Pierce Counties.[1]

Upland plateaus incised by the valley trough and flood plain of the Green River are the principal topographic features of the sewerage area. The ascent to the upland areas is abrupt, with differences in elevation between the river bottom and the plateau in excess of 300 feet. The uplands present a rolling glacial relief characterized by depressions and hummocks in which stream courses and drainage patterns are often poorly defined. Numerous local basins and depressions of retarded drainage are occupied by small lakes and swampy areas and bogs. The

Green River is artificially controlled by an upstream dam and manmade levees, which parallel the stream throughout most of its length within the sewerage area.

In addition to its diverse topography, the sewerage area is characterized by a variety of land uses: agriculture and sharply contrasting industrial development in the Green River Valley; retail, commercial and residential uses in the cities and towns; and forestry, mining, open space, recreation, and scattered rural, residential and farming uses on the eastern uplands.

Recent photogrammetric interpretations of the sewerage area reveal that roughly 59 percent of the land is either undeveloped woodland and open space or devoted to agricultural and recreational use. Residential and commercial uses occupy 24 percent of the land, while only 1 percent is currently used for industrial purposes. The remainder is used for other miscellaneous purposes, such as transportation and utility facility corridors.[1]

Land use trends for the majority of the sewerage area are toward more intensive uses, particularly in the Green River Valley flood plain. The annexation of valley bottom lands by Kent and Auburn, and the subsequent zoning of these lands to industrial and commercial classifications, has stimulated dramatic changes in land uses from the traditional dominance of agriculture to more intensive uses, with consequent demands for increased utility service.

Existing land use patterns in the Green River Valley area are depicted on maps available at the Puget Sound Governmental Conference (PSGC). Projected 1990 land use for the same area that would result if the land use plans generated by local planning agencies are realized, are also depicted on PSGC maps. Comparison of these maps indicates that much of the land along the railroad and major road running along the valley floor that is currently open space and rural is projected to become developed for industrial, commercial, and residential uses in 1990.

Recent air quality data from the Puget Sound Air Pollution Control Agency's (PSAPCA's) Auburn and Kent monitoring stations indicate that levels of particulate matter in the proposed interceptor service area are very close to the air quality standard. This fact, together with the levels of development and urbanization expected to occur in the area, has led to the present concern over the potential air quality impacts of such growth and, in turn, to the need for the present analysis.

II. METHODOLOGY

INITIAL POLICY ASSUMPTIONS

Two fundamental policy assumptions were made at the outset of the analysis in order to reduce the magnitude of the task to manageable proportions. First, the year 1990 was selected as the target year for the analysis, even though the interceptor was sized according to a projection to the year 2000. This was done for two reasons:

- It is not possible to project the nature or efficiency of air pollution control technology 25 years in advance; a projection to 1990 is itself fraught with uncertainty. The same may be said about land use, population, and motor vehicle travel projections as well. Any errors in sewage treatment capacity projections can be corrected at a later date through a variety of means such as the construction of additional treatment facilities, or the under-utilization of installed capacity, whereas for an air quality analysis the overall precision is crucial since the projected air quality must be compared to an established air quality standard. Therefore, it was not considered meaningful to attempt to project air quality in the year 2000.
- PSGC has made its most detailed projections of population, employment, and motor vehicle activity up to the year 1990. If this resource were to be utilized at all, 1990 would be the furthest possible projection year.

The second assumption was that sources large enough to be considered point sources would not be projected since such sources would be reviewed individually under EPA's and PSAPCA's new source review programs. Under these programs, any proposed source found to cause a violation of an existing air quality standard may be denied a permit to construct.[2] Thus, the emission projection and subsequent air quality analysis are concerned with the impact of increased emissions due to "area sources" of particulate matter. These sources include residential, commercial, and small industrial space heating units, motor vehicles, railroads, fugitive dust (due to travel on dirt roads, construction activity, and structural fires), incineration, open burning, and off-highway vehicle emissions.

ALTERNATIVE METHODOLOGIES FOR AREA SOURCE PROJECTION

In any projection of future conditions for a specific area, many uncertainties and simplifying assumptions must be made, such that the accuracy of the resulting projection may be questioned on many fronts. In such a situation, an important consideration is that the bases for estimating both base-year and projected emissions are comparable. In this way, the analysis may at least be considered internally consistent, and projected emissions may be compared with base-year emissions in a meaningful way.

With this in mind, three alternative projection methodologies were identified:

- Extrapolate existing emissions at an assumed growth rate, and assume that the growth occurs "in place" (i.e., at the identical locations of present sources).
- Assume that emissions changes occur in proportion to the acreages planned or zoned for each individual purpose.
- Assume that emission changes occur in proportion to various indices of "activity" appropriate to each source category (e.g., manufacturing employment is an indicator of industrial activity and hence emissions).

The "growth in place" assumption is unrealistic due to the large amounts of vacant land presently zoned for higher intensity uses in the proposed service area of the Auburn Interceptor. The second approach--using land acreages as an index of change in emissions--is also unrealistic since the mere designation of land for a given purpose in no way guarantees that it will actually be developed as designated by a given date. Private development decisions are influenced by many factors, with zoning being only one consideration. Furthermore, according to PSGC, there is sufficient land designated for industrial use in the Green River Valley alone to accommodate all of the industrial growth projected for the entire Puget Sound four-county area to the year 2000.[3] Obviously, not all of the region's growth is going to occur in the Valley, making the use of acreages unrealistic as an index of emission changes.

The third approach--using activity projections (developed by PSGC) as indices of emission changes--was judged to be the most realistic approach. Basically, PSGC has both baseline and projected estimates of population, employment, and trip generation on a subarea basis (activity allocation model districts). These estimates may be used as a measure of emission changes; since the estimates are spatially disaggregated, they may be used to generate area-specific emission estimates. Studies by the Argonne National Laboratory[4, 12] have indicated essentially the same conclusion--that economic indices of growth provide better estimates for emission projection purposes than either the land acreage methodology or the "growth in place" assumption.

DESCRIPTION OF THE SELECTED METHODOLOGY

The use of activity allocation data provided by PSGC proceeds as follows:

- o Select the index most appropriate for each emission source category (e.g., residential fuel combustion emissions are directly related to the population projections and distribution).
- o Calculate base-year emission factors from index totals for King County. (The interceptor service area lies almost entirely within King County.)
- o Allocate 1973 emissions on the basis of PSGC index allocations for the districts within the sewerage area.

- Calculate emission factor reductions due to implementation of known control regulations by 1990 (open burning and residential incineration prohibited, and catalytic converters used on all automobiles).
- Compute 1990 emission factors.
- Compute 1990 district emissions on the basis of PSGC projected index allocations.

Emission Factor Development

Emissions due to residential fuel combustion, open burning and incineration, as well as structural fires, were allocated according to population within each district. Commercial and institutional fuel combustion emissions were allocated according to non-manufacturing employment while industrial fuel combustion and process losses were allocated according to manufacturing employment. Emissions due to off-highway vehicle activity, dirt roads, construction, forest fires, and slash burning were allocated according to land area (i.e., emissions were assumed to be spread evenly across the entire county). Highway vehicle emissions were allocated according to vehicle trip end data obtained from PSGC. (A more detailed explanation of this procedure is presented later.) Finally, aircraft and ship emissions were not included in the analysis since aircraft activity at the Auburn airport is negligible, and there is no known ship activity in the service area.

Table C-1 summarizes the development of 1973 particulate emission factors for each source category. Table C-2 summarizes the development of 1990 emission factors, indicating the percentage reductions in each source category anticipated to result from the implementation of various control programs. In the residential sector, open burning and incineration should be prohibited by 1990, resulting in a 20 percent reduction in average residential emissions per person. The same regulations apply to the commercial and industrial sectors, resulting in the changes indicated. In the case of forest fires and slash burning, roughly 40 percent of the service area is presently forested. Due to urban development

TABLE C-1. 1973 AREA SOURCE PARTICULATE EMISSION FACTOR DEVELOPMENT

Emission Projection Category	1972-73 Tons/Year King County[1]	Projection Index	1973 Index Total, King County[2]	1973 Particulate Emission Factor
Residential	1,196	Population	1,181,874	1.012 tons/10^3 pop.
Commercial/Institutional	703	Non-manufacturing employment	336,688	2.088 tons/10^3 emp.
Industrial	1,089	Manufacturing employment	103,608	10.511 tons/10^3 emp.
Off-Highway	280	District land area	455,169	0.615 tons/10^3 acres
Aircraft	120	N/A*	N/A*	N/A*
Vessels	216	N/A*	N/A*	N/A*
Dirt Roads	1,036	District land area	455,169	2.276 tons/10^3 acres
Construction Land	120	District land area	455,169	0.264 tons/10^3 acres
Forest Fires/Slash Burning	709	Land area	455,169	1.558 tons/10^3 acres
Structural Fires	629	Population	1,181,874	0.532 tons/10^3 pop.
Highway Vehicle Emissions	4,575	Trip ends	5,172,000	0.885 tons/10^3 trip ends
	10,673			

---

*N/A = not applicable. No significant ship traffic in the service area. Also, aircraft activity is included in the point source inventory.

[1] Area source emission estimates were obtained using a combination of EPA and PSAPCA data. 1973 emission data are available at EPA Region X. EPA data on fugitive dust emissions from dirt roads, construction, and structural fires were used since PSAPCA did not include them in their inventory. PSAPCA data were used in all other categories, with EPA data on the distribution of open burning and incineration emissions among the residential, commercial, and industrial sectors.

[2] Provided by PSCG

TABLE C-2. 1990 AREA SOURCE EMISSION FACTORS

Category	1973 Particulate Emission Factor	Reduction Factor due to Regulations, Controls	1990 Emission Factor
Residential	1.012 tons/10^3 pop.	20%[1]	0.810 tons/10^3 pop.
Commercial/Institutional	2.088 tons/10^3 emp.	17%[1]	1.733 tons/10^3 emp.
Industrial	10.511 tons/10^3 emp.	11%[1]	9.355 tons/10^3 emp.
Off-Highway	0.615 tons/10^3 acres	none	0.615 tons/10^3 acres
Dirt Roads	2.276 tons/10^3 acres	none	2.276 tons/10^3 acres
Construction Land	0.264 tons/10^3 acres	none	0.264 tons/10^3 acres
Structural Fires	0.532 tons/10^3 pop.	none	0.532 tons/10^3 pop.
Forest Fires/Slash Burning	1.558 tons/10^3 acres	50%[2]	0.753 tons/10^3 acres
Highway Vehicles	0.885 tons/10^3 trip ends	33%[3]	0.593 tons/10^3 trip ends

---

[1] Reduction due to anticipated prohibition of open burning and on-site residential incineration.

[2] Reduction due to increased urbanization of the forested areas.

[3] Reduction due to the anticipated use of oxidizing catalysts on automobiles.

and its associated improvement in fire services and reduction in forested land, a 50 percent reduction in emissions per acre has been assumed from this source category.

Finally, in the case of motor vehicle particulate emissions, by 1990 it is anticipated that all cars will be equipped with oxidizing catalytic converters. Exhaust particulate emission factors developed through studies performed by ESSO Research and Engineering[5] are shown in Table C-3.

Assuming that monolithic catalysts on Ford Motor Company autos comprise roughly 25 percent of the operating vehicle fleet in 1990, the weighted average exhaust particulate emission factor is .16 gm/mi. A recent draft revision to AP-42[6] indicates that an emission factor of .1 gm/mi is appropriate for post-1974 catalyst-equipped vehicles. (In either case, the emission factor for tire wear remains the same at .20 gm/mi.) When compared to the present exhaust emission factor of .34 gm/mi, the conclusion is that, by 1990, when the entire vehicle fleet will consist of post-1974 vehicles, the total particulate emission factor (including tire wear) should be about 55 percent to 67 percent of the present value--a reduction of from 33 to 45 percent. A 33 percent reduction has been assumed for the purposes of this analysis.

It must be noted, however, that the composition of the particulates emitted differs dramatically from the composition of particulates emitted from vehicles not equipped with catalytic devices. Over 90 percent of the catalyst particulate emission is in the form of sulfates, sulfuric acid and water bound to the sulfuric acid, whereas from unequipped vehicles, sulfates and sulfuric acid compose but a trace amount of particulate emissions. Unfortunately, since there is presently no air quality

TABLE C-3. PARTICULATE EMISSIONS FROM NEW CARS EQUIPPED WITH CATALYTIC MUFFLERS (IN GRAMS PER MILE)

Catalyst	Test Cycle	Fuel Sulfur, %	Total Particulates	Sulfates	Water	Platinum
Monolithic Noble Metal[1]	1972 Federal Test Cycle	0.067[3]	0.287[4]	0.126[4]	0.111[4]	0.0002
Pelletized Oxidation[2]	1972 Federal Test Cycle	0.065	0.118	0.036	N/A	0.0002

N/A = Not available

---

[1] Characteristic of Ford Motor Company catalytic mufflers.

[2] Characteristic of General Motors Company catalytic mufflers.

[3] This is the average content (percent by weight) of sulfur in Southern California gasoline.

[4] Average.

standard for sulfates, the emissions have simply been considered as particulate matter.[*]

Area Source Emission Allocation Procedure

The procedure adopted for allocating area source emissions to the activity allocation districts within the proposed service area was composed of four steps. First, the appropriate districts lying within the service area were identified. These districts are shown in Figure C-1, along with the service area boundary. Second, of the twenty zones within the service area, ten are only partially included. The fraction of these districts lying within the service area was therefore estimated.

Third, the population and employment data provided by PSGC[7] for each district were modified to reflect the distribution of land uses indicated by the composite land use plans of the local planning agencies in the Interceptor service area. The recent compromise between PSGC and the City of Auburn[8] concerning the land use plan for the Auburn area has underscored the weakness of PSGC's position in specifying land use in specific areas of the region. This is distinct from PSGC's stronger position in estimating population and economic conditions in future years. For the purposes of the area source emission projection, it is more realistic to assume that the local composite land use plan for the service area developed from the local agency plans will be more representative of future land use conditions than the land use element developed by PSGC. With this in mind, PSGC's district projections of population and employment for the Auburn Interceptor service area were distributed according to the land use indicated in the local plans. Total population and

---

[*] The Administrator of the Environmental Protection Agency recently announced his support of a proposal to delay enforcement of 1977 auto emission standards to 1982 to avoid the potential sulfate problem. However, no official action or decision on the matter has been made by Congress. On the basis of existing regulations, the catalysts will be used; hence, there is no formal basis upon which to modify this assumption.

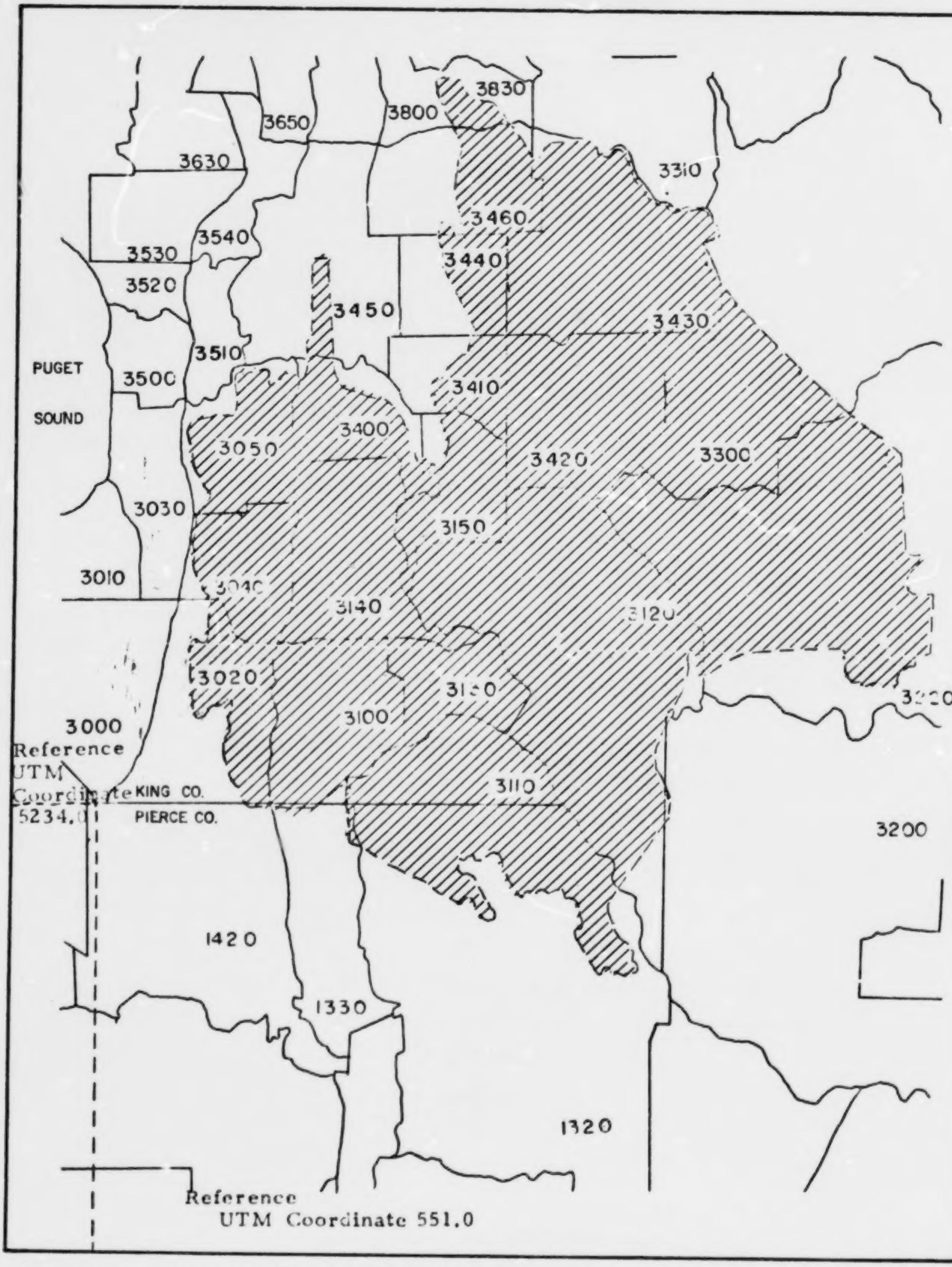
3830
3650
3800
3630
3310
3460
3540
3530
3440
3520
3450
3430
3510
PUGET
SOUND
3500
3410
3400
3050
3420
3300
3030
3150
3010
3040
3140
3120
3020
3130
3220
3000
3100
3110
Reference
UTM
Coordinate
5234.0
KING CO.
PIERCE CO.
3200
1420
1330
1320
Reference
UTM Coordinate 551.0

FIGURE 3. AUBURN INTERCEPTOR SERVICE AREA (HATCHED) OVERLAID ON PSGC ACTIVITY ALLOCATION DISTRICTS

employment projected for the service area were conserved during the reallocation process by the following method: Any activity (such as manufacturing employment) which was projected by PSGC to occur in a given area but which was not indicated by the land use designations for that district under the local plans was tabulated separately and then added to the districts which had the appropriate land use designations. Thus, 450 manufacturing employees in 1973 were displaced to other districts. They were proportionately distributed to the other districts according to the number of manufacturing employees already in those districts. The total manufacturing employees not displaced was 8,497. Hence, in each district, the number of manufacturing employees was increased by 450/8,497 = 5 percent to account for those displaced. Similarly, displaced non-manufacturing employees accounted for 19 percent of the non-displaced employees in this class in 1973. In 1990, the "displacement factors" are approximately 6 percent and 29 percent for manufacturing and non-manufacturing employees, respectively.

Finally, the resulting land area, population, and employment by district within the service area were tabulated for 1973 and 1990, and then multiplied by the appropriate emission factors to obtain total area source particulate emissions by district within the Interceptor service area. Table C-4 summarizes the district population and employment data for 1973. These data were obtained by a straight-line interpolation of 1970 and 1975 population and employment data provided by PSGC. The percent of each "activity" estimated to be within the Interceptor service area is indicated in parentheses next to each entry. Table C-5 summarizes the same information for 1990, including the land area in acres for each district. (The acreages are the same in 1973.)

The Allocation of Motor Vehicle Particulate Emissions

Tables C-4 and C-5 also indicate vehicle trip end data by district. The basis for selection of these data for allocation purposes is described in this section. To allocate motor vehicle travel emissions, it was first

TABLE C-4. 1973 ACTIVITY ALLOCATION DATA

AAM District	1973 Population	1973 Manufacturing Employment	1973 Non-Manufacturing Employment
1320	7,259 (25)	26 (0)	161 (0)
3020	6,223 (50)	300 (0)*	319 (0)*
3040	3,372 (100)	17 (100)	388 (100)
3050	8,577 (100)	139 (0)*	433 (0)*
3100	10,716 (100)	6,606 (100)	2,205 (100)
3110	378 (100)	0 (-)	24 (100)
3120	4,934 (100)	47 (100)	8 (100)
3130	4,550 (100)	135 (100)	573 (100)
3140	10,127 (100)	355 (100)	3,283 (100)
3150	3,665 (100)	6 (0)*	175 (0)*
3220	4,801 (50)	19 (100)	98 (100)
3300	9,202 (25)	5 (0)*	464 (25)
3400	4,528 (50)	408 (100)	1,015 (100)
3410	4,472 (50)	3 (50)	744 (0)
3420	6,479 (100)	0 (-)	257 (100)
3430	3,684 (100)	0 (-)	50 (0)*
3440	8,251 (50)	0 (-)	573 (0)*
3450	6,970 (0)	9,103 (5)	3,156 (5)
3460	9,109 (50)	6 (50)	476 (0)*
3830	12,081 (25)	6 (0)	833 (0)

()Indicates percent of activity index within the service area.

*Denotes that this quantity will be shifted to other zones to make PSGC data compatible with local agency land use plans.

TABLE C-5. 1990 ACTIVITY ALLOCATION DATA

AAM District	Gross Area (Acres)	1990 Population	1990 Manufacturing Employment	1990 Non-Manufacturing Employment
1320	2,756 (25)	14,882 (25)	130 (0)	508 (0)
3020	5,494 (50)	10,173 (50)	1,132 (0)*	500 (0)*
3040	2,254 (100)	6,372 (100)	98 (100)	541 (100)
3050	3,407 (100)	13,613 (100)	377 (0)*	1,149 (0)*
3100	3,993 (100)	12,071 (100)	13,376 (100)	3,018 (100)
3110	3,042 (100)	2,851 (100)	12 (100)	252 (100)
3120	15,832 (100)	8,164 (100)	274 (100)	699 (100)
3130	1,964 (100)	5,977 (100)	225 (100)	1,034 (100)
3140	4,731 (100)	11,140 (100)	316 (100)	4,737 (100)
3150	2,700 (100)	7,675 (100)	9 (0)*	596 (0)*
3220	24,034 (50)	9,261 (100)	28 (100)	282 (100)
3300	34,062 (25)	14,782 (25)	23 (0)*	718 (25)
3400	2,766 (75)	6,711 (50)	409 (100)	2,161 (100)
3410	2,158 (50)	8,500 (50)	0 (-)	2,372 (0)
3420	5,730 (100)	15,860 (100)	0 (-)	978 (100)
3430	7,455 (100)	11,039 (100)	0 (-)	497 (0)*
3440	2,583 (50)	15,594 (50)	0 (-)	1,533 (0)*
3450	6,538 (5)	10,241 (0)	14,328 (5)	6,060 (5)
3460	4,277 (50)	19,701 (50)	0 (-)	1,590 (0)*
3830	2,218 (25)	15,880 (25)	40 (0)	1,174 (0)

() Indicates percent of activity index within the service area.

* Denotes that this quantity will be shifted to other zones to make PSGC data compatible with local agency land use plans.

necessary to prepare estimates of motor vehicle activity resulting from urbanization within the Auburn Interceptor service area. Estimates were desired for the 1973 base year and the 1990 target year.

To prepare a precise estimate of VMT resulting from urbanization of the service area would require traffic counts, forecasts, and corresponding roadway section lengths for all street and highway routes in the service area. Such a set of data does not exist. Alternatively, VMT could be estimated through use of the PSGC regional transportation computer simulation models, using special techniques to cordon and evaluate the Interceptor service area. A third method would involve the use of basic PSGC trip generation data for the service area.

Since it is motor vehicle activity generated as a result of urbanization of the service area which is desired, the trip generation data is a more appropriate measure of such activity than link-by-link traffic count data. Traffic count data include through travel in addition to travel having origins or destinations within the service area. Through trips would not be a result of urbanization within the service area, i.e., they would occur whether or not the service area were further developed. Through travel would likely account for roughly 10 percent of the total trips. In addition, simply estimating travel within the service area would not account for travel resulting outside the service area due to urbanization within it (e.g., people commuting to employment centers within the service area from outside of it, and vice versa). However, trip generation data are directly related to the nature of the trip origins and attractions within the service area, and allocation of motor vehicle particulate emissions according to the trip generation data gives a better indication of emissions resulting from urbanization within a given subarea of a region. Although not all of the emissions thus allocated to specific zones will, in fact, be generated in those zones, it was considered best to account for the emissions in this fashion, rather than to neglect the emissions generated outside the service area due to urbanization within the area.

PSGC land use and transportation data are tabulated by small geographic subareas of the four-county region. Two different sets of data subdivision have been developed: (1) traffic analysis zones (TAZ's), of which there are approximately 600 in the PSGC area exclusive of islands, and (2) activity allocation model districts (AAM's), of which there are approximately 240 in the mainland study area. Within the Auburn Interceptor service area, there are 40 TAZ's and 20 AAM districts.

Trip generation and travel forecasts by AAM districts have not yet been completed by the PSGC. Hence, previous PSGC trip generation forecasts (quantified by TAZ) were utilized for the VMT analysis. These forecasts were based on PSGC's 1972 population and employment forecasts.[9]

The 40 TAZ's in the Auburn Interceptor service area were aggregated to correspond with the AAM district boundaries. The 1972 and revised 1973 PSGC population and employment forecasts for the service area were compared and found to be approximately within 5 percent of each other.

Person-trips generated by TAZ areas were acquired from PSGC trip generation data.[10] These included 1975 and 1990 forecasts. Since population and employment estimates in the service area differ by less than 2 percent between 1970 and 1975, the 1975 forecasts were assumed to be representative of the 1973 baseline condition sought for this study. Person trip ends were converted to vehicle trip ends using PSGC average vehicle occupancy factors.[11] Table C-6 summarizes the results of this analysis.

TABLE C-6. TRIP GENERATION ESTIMATES FOR THE AUBURN INTERCEPTOR SERVICE AREA

AAM District	Person Trip Ends		Vehicle-Trip Ends*	
	1973	1990	1973	1990
1320	7,400	31,500	4,700	19,900
3020	37,900	80,400	24,300	50,900
3040	28,900	54,700	18,500	34,600
3050	22,500	37,600	14,400	23,800
3100	107,400	198,300	68,800	125,500
3110	12,600	43,000	8,100	27,200
3120	45,400	89,200	29,100	56,500
3130	11,200	18,100	7,200	11,500
3140	93,700	151,000	60,100	95,600
3150	31,900	61,500	20,400	38,900
3220	12,000	28,800	7,700	18,200
3300	9,400	15,400	6,000	9,800
3400	35,600	64,000	22,800	40,500
3410	22,600	43,600	14,500	27,600
3420	19,800	31,900	12,700	20,200
3430	32,500	61,000	20,800	38,600
3440	14,800	29,900	9,500	18,900
3450	40,500	66,200	26,000	41,900
3460	42,500	78,600	27,200	49,700
Total	628,600	1,184,700	402,800	749,800
King County	8,068,000	11,431,000	5,172,000	7,235,000

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*Average Car Occupancy (ACO): 1975, 1.56; 1990, 1.58.
(See Reference 11)

III. RESULTS

Table C-7 summarizes the data used to allocate 1973 area source particulate emissions in the Interceptor service area. Combining these data with the 1973 emission factors yields the particulate emissions per district as indicated.

Table C-8 summarizes the analogous information for the projection and allocation of 1990 particulate emissions. When compared to 1973 emission levels, an overall increase of approximately 20 percent in area source emissions is projected to occur within the service area. This relatively modest increase in emissions may be attributed to two factors. First, the anticipated controls lowered the emission factors in certain source categories as shown in Table C-2. Second, even though population and employment are projected to increase by much more than 20 percent, land area remains constant. By far, the largest single portion of this growth is expected to occur in district 3100, due primarily to the growth in manufacturing employment projected for this district by PSGC. While it may be questioned whether such significant growth may be concentrated in a single district, there is no objective basis for assuming an alternative, more dispersed growth pattern. Since district 3100 encompasses an already developing part of the service area, it is not unreasonable to assume that further development would be attracted to the same vicinity.

The results of the emissions analysis which serve as inputs to the air quality modeling analysis are summarized in Table C-9. The UTM (Universal Transverse Mercator) coordinates of the geographic centroid for each activity allocation district were obtained by overlaying the district boundaries on U. S. Geological Survey maps of the Interceptor service area. In addition, acreages per district were obtained from PSGC. The emissions listed for districts 3100, 3140, and 3400 differ from those shown in Tables C-7 and C-8 due to the addition of railroad emissions.

TABLE C-7. 1973 DISTRICT EMISSION CALCULATION

AAM District	Population	Manufacturing Employment	Non-Manufacturing Employment	Land Area	Trip Ends	Emissions (tons/year)
1320	1,815	0	0	4,689	4,700	29.06
3020	3,112	0	0	2,747	24,300	39.26
3040	3,372	18	462	2,254	18,500	33.36
3050	8,577	0	0	3,407	14,400	42.04
3100	10,716	6,936	2,624	3,993	68,800	174.64
3110	378	0	29	3,042	8,100	22.15
3120	4,934	49	10	15,832	29,100	108.52
3130	4,550	142	682	1,964	7,200	25.57
3140	10,127	373	3,907	4,731	60,100	103.20
3150	3,665	0	0	2,700	20,400	36.44
3220	2,400	20	117	12,017	7,700	67.61
3300	2,301	0	138	8,516	6,000	49.29
3400	2,264	428	1,208	2,075	22,800	40.47
3410	2,236	2	0	1,079	14,500	21.39
3420	6,479	0	306	5,730	12,700	48.89
3430	3,684	0	0	7,455	20,800	59.23
3440	4,125	0	0	1,292	9,500	20.87
3450	0	478	188	327	26,000	29.97
3460	4,554	3	0	2,138	27,200	41.21
3830	3,020	0	0	554	Lumped*	7.27
Total	82,309	8,449	9,671	86,541	402,800	1,000.43

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*As a result of the TAZ to AAM aggregation process, trip ends for this district were lumped into district 3460

TABLE C-8. 1990 DISTRICT EMISSION CALCULATION

AAM District	Population	Manufacturing Employment	Non-Manufacturing Employment	Land Area	Trip Ends	Emissions (tons/year)
1320	3, 720	0	0	4, 689	19, 900	35.24
3020	5, 087	0	0	2, 747	50, 900	47.82
3040	6, 372	104	698	2, 254	34, 600	40.12
3050	13, 613	0	0	3, 407	23, 800	45.79
3100	12, 071	14, 179	3, 893	3, 993	125, 500	245.72
3110	2, 851	13	325	3, 042	27, 200	32.61
3120	8, 164	290	902	15, 832	56, 500	110.20
3130	5, 977	239	1, 334	1, 964	11, 500	27.11
3140	11, 140	335	6, 111	4, 731	95, 600	103.98
3150	7, 675	0	0	2, 700	38, 900	43.99
3220	9, 261	30	364	12, 017	18, 200	71.41
3300	3, 696	0	232	8, 516	9, 800	44.68
3400	3, 355	434	2, 788	2, 075	40, 500	45.57
3410	4, 250	0	0	1, 079	27, 600	26.32
3420	15, 860	0	1, 262	5, 730	20, 200	57.99
3430	11, 039	0	0	7, 455	38, 600	67.03
3440	7, 797	0	0	1, 292	18, 900	26.75
3450	0	759	391	327	41, 900	33.91
3460	9, 851	0	0	2, 138	49, 700	51.10
3830	3, 970	0	0	554	Lumped*	7.51
Total	145, 749	16, 383	18, 300	86, 541	749, 800	1,165.66

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*As a result of the TAZ to AAM aggregation process, trip ends for this district were lumped into district 3460

TABLE C-9. AREA SOURCE EMISSION INVENTORY, 1973 and 1990

AAM District	UTM Coordinates X	UTM Coordinates Y	Service Land Area (acres)	1973 Emissions (tons/year)	1990 Emissions (tons/year)
1320	563.5	5,232.8	4,689	29.06	35.24
3020	555.2	5,236.8	2,747	39.26	47.82
3040	555.4	5,241.4	2,254	33.36	40.12
3050	555.7	5,244.8	3,407	42.04	45.79
3100	557.9	5,236.5	3,993	189.65*	274.72*
3110	561.9	5,235.1	3,042	22.15	32.61
3120	565.8	5,238.6	15,832	108.52	110.20
3130	561.5	5,237.7	1,964	25.57	27.11
3140	558.4	5,242.0	4,731	117.20*	132.98*
3150	561.9	5,243.6	2,700	36.44	43.99
3220	570.9	5,240.6	12,017	67.61	71.41
3300	570.2	5,245.7	8,516	49.29	44.68
3400	558.4	5,245.5	2,075	55.47*	74.57*
3410	562.0	5,246.9	1,079	21.39	26.32
3420	565.6	5,246.1	5,730	48.89	57.99
3430	566.4	5,251.1	7,455	59.23	67.03
3440	561.4	5,249.9	1,292	20.87	26.75
3450	557.4	5,249.1	327	29.97	33.91
3460	562.8	5,253.1	2,138	41.21	51.10
3830	562.0	5,255.3	554	7.27	7.51
Total			86,541 acres	1,045.43	1,252.66

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*Includes contribution due to railroad activity.

According to PSAPCA approximately 180 tons of particulate were emitted from railroad locomotives in King County, exclusive of station operations. On the basis of estimated track-miles, 45 tons were assumed to be generated in the Interceptor service area and were distributed equally among the three districts. In 1990, the railroad emissions were projected to increase by 94 percent on the basis of total manufacturing employment growth in the service area.

Finally, Table C-10 is a comparison of key statistics for the service area relative to King County for 1973, based on the data generated in this study.

TABLE C-10. COMPARISON OF 1973 KING COUNTY AND AUBURN INTERCEPTOR SERVICE AREA STATISTICS

Parameter	King County	Interceptor Service Area	Percent in the Service Area
Population	1,181,874	82,309	7%
Land Area (acres)	455,169	86,541	19%
Manufacturing Employment	103,608	8,449	8%
Non-manufacturing Employment	336,688	9,671	3%
Number of Trip Ends	5,172,000	402,800	8%
Particulate Emissions	10,673	1,031	10%

IV. SUMMARY

Emissions of suspended particulate matter from area sources in the service area of the Auburn Interceptor have been projected to the year 1990. In addition, the emissions were disaggregated in both the base year (1973) and the target year (1990) according to activity allocation districts defined by the Puget Sound Governmental Conference (PSGC). Projections of population, employment, and motor vehicle activity obtained from PSGC on a district basis were combined with area source emissions estimates provided by both the Puget Sound Air Pollution Control Agency and the Environmental Protection Agency, Region X, to produce the emissions estimates.

The results of the emissions analysis indicate that an approximately 20 percent increase in area source particulate emissions may be expected to occur in the Interceptor service area by 1990. It should be noted that several key assumptions were made in order to arrive at the emission estimates. Should conditions change in the future, or additional evidence come to light concerning these assumptions, the results should be modified accordingly.

V. REFERENCES

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4. Kennedy et al., "Air Pollution-Land Use Planning Project--Phase I Final Report," Argonne National Laboratory Center for Environmental Studies, November 1971.

5. Campion, R. J., et al., "Measurement of Vehicle Particulate Emissions," Society of Automotive Engineers, Paper No. 740186, 1974.

6. Personal communication with Mr. Ron Malatesta, Environmental Protection Agency, Region X, February 27, 1975.

7. Puget Sound Governmental Conference, "Puget Sound Governmental Conference Interim Regional Development Plan Forecasts, 1970 1990," November 1973.

8. Wilsey & Ham, Inc., "Environmental Assessment of the Auburn Interceptor," Appendix to "Auburn Interceptor Environmental Impact Statement," Municipality of Metropolitan Seattle, January 1974.

9. Puget Sound Governmental Conference, "Population and Employment Forecasts and Distribution for the Central Puget Sound Region, 1975-1990," revised 1972.

10. Sachdev, L.S., and L. Karlfritz, "Trip Generation Update," Puget Sound Governmental Conference, 1972.

11. Sachdev, L.S., "Forecasting Travel Patterns," Puget Sound Governmental Conference, 1972.

12. Baldwin, T.E., and A.S. Kennedy, "The Feasibility of Predicting Point Source Emissions Using Industrial Land Use Variables: A Path Analysis," presented at the 67th Annual Meeting of the Air Pollution Control Association, Denver, Colorado, June 9-13, 1974.

APPENDIX D

TABLE A. FAUNA OF THE SEWERAGE AREA

AMPHIBIANS AND REPTILES

*Northwestern Salamander	Ambystoma gracile
*Long-toed Salamander	Ambystoma macrodactylum
*Pacific Giant Salamander	Dicamptodon ensatus
*Rough-skinned Newt	Taricha granulosa
*Western Red-backed Salamander	Plethodon vehiculum
*Oregon Salamander	Ensatina eschscholtzi oregonesis
*Tailed Frog	Ascaphus truei
*Western Toad	Bufo boreas
*Pacific Treefrog	Hyla regilla
*Red legged Frog	Rana aurora
*Spotted Frog	Rana pretiosa
*Bullfrog	Rana catesbiana
*Western Pond Turtle	Clemmys marmorata
Western Fence Lizard	Sceloporus occidentalis
Northern Alligator Lizard	Gerrhonotus coeruleus
Rubber Boa	Charina bottae
*Common Garter Snake	Thamnophis sirtalis
*Western Terrestrial Garter Snake	Thamnophis elegans
Northwestern Garter Snake	Thamnophis ordinoides

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* These species utilize wetlands

BIRDS

Common Loon	*Gavia immer*
Horned Grebe	*Podiceps auritus*
Western Grebe	*Aechmophorus occidentalis*
*Pied-billed Grebe	*Podilymbus podiceps*
Double-crested Cormorant	*Phalacrocorax auritus*
*Great Blue Heron	*Ardea herodias*
*Green Heron	*Butorides virescens*
*American Bittern	*Botaurus lentiginosus*
*Whistling Swan	*Olor columbianus*
*Canada Goose	*Branta canadensis*
Brant	*Branta nigricans*
White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen hyperborea*
*Mallard	*Anas platyrhynchos*
*Gadwall	*Anas strepera*
*Pintail	*Anas acuta*
*Green-winged Teal	*Anas carolinensis*
*Blue-winged Teal	*Anas discors*
*Cinnamon Teal	*Anas cyanoptera*
*European Widgeon	*Mareca penelope*
*American Widgeon or Baldpate	*Mareca americana*
*Shoveler	*Spatula clypeata*
*Wood Duck	*Aix sponsa*
*Redhead	*Aythya americana*

*Ring-necked Duck	*Aythya collaris*
*Canvasback	*Aythya valisineria*
*Greater Scaup	*Aythya marila*
*Lesser Scaup	*Aythya affinis*
*Common Goldeneye	*Bucephala clangula*
*Bufflehead	*Bucephala albeola*
*Harlequin Duck	*Histrionicus histrionicus*
White-winged Scoter	*Melanitta deglandi*
Surf Scoter	*Melanitta perspicillata*
Common Scoter	*Oidemia nigra*
Ruddy Duck	*Oxyura jamaicensis*
*Hooded Merganser	*Lophodytes cucullatus*
*Common Merganser	*Mergus merganser*
*Red-breasted Merganser	*Mergus serrator*
Goshawk	*Accipiter gentilis*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
*Bald Eagle	*Haliaeetus leucocephalus*
*Marsh Hawk	*Circus cyaneus*
Osprey	*Pandion haliaetus*
Gyrfalcon	*Falco rusticolus*
Peregrine Falcon	*Falco peregrinus*
Pigeon Hawk	*Falco columbarius*

Sparrow Hawk	*Falco sparverius*
Ruffled Grouse	*Bonasa umbellus*
California Quail	*Lophortyx californicus*
Ring-necked Pheasant	*Phasianus colchicus*
Virginia Rail	*Rallus limicola*
*American Coot	*Fulica americana*
*Killdeer	*Charadrius vociferus*
*Common Snipe	*Capella gallinago*
*Spotted Sandpiper	*Actitis macularia*
*Greater Yellowlegs	*Totanus melanoleucus*
*Lesser Yellowlegs	*Totanus flavipes*
*Pectoral Sandpiper	*Erolia melanotos*
Least Sandpiper	*Erolia minutilla*
Dunlin	*Erolia alpina*
Long-billed Dowitcher	*Limnodromus scolopaceus*
*Western Sandpiper	*Ereunetes mauri*
*Wilson's Phalarope	*Steganopus tricolor*
*Glaucous-winged Gull	*Larus glaucescens*
*Western Gull	*Larus occidentalis*
*California Gull	*Larus californicus*
*Ring-billed Gull	*Larus delawarensis*
*Mew Gull	*Larus canus*
Bonaparte's Gull	*Larus philadelphia*
Band-tailed Pigeon	*Columba fasciata*

Rock Dove	Columba livia
Mourning Dove	Zenaidura macroura
Barn Owl	Tyto alba
*Snowy Owl	Nyctea scandiaca
Spotted Owl	Strix occidentalis
*Short-eared Owl	Asio flammeus
Common Nighthawk	Chordeiles minor
Black Swift	Cypseloides niger
Vaux's Swift	Chaetura vauxi
Anna's Hummingbird	Calypte anna
Rufous Hummingbird	Selasphorus rufus
*Belted Kingfisher	Megaceryle alcyon
Red-shafted Flicker	Culaptes cafer
Hairy Woodpecker	Dendrocopos villosus
*Downy Woodpecker	Dendrocopos pubescens
*Traill's Flycatcher	Empidonax traillii
Western Flycatcher	Empidonax difficilis
Western Wood Pee Wee	Contopus sordidulus
Olive-sided Flycatcher	Nuttallornis borealis
Horned Lark	Eremophila alpestris
Violet-green Swallow	Tachycineta thalassina
*Tree Swallow	Iridoprocne bicolor
Bank Swallow	Riparia riparia
*Rough-winged Swallow	Stelgidopteryx ruficollis

*Barn Swallow	*Hirundo rustica*
*Cliff Swallow	*Petrochelidon pyrrhonota*
Purple Martin	*Progne subis*
Steller's Jay	*Cyanocitta stelleri*
*Common Crow	*Corvus brachyrhynchos*
*Black-capped Chickadee	*Parus atricapillus*
Chestnut-backed Chickadee	*Parus rufescens*
*Common Bushtit	*Psaltriparus minimus*
Winter Wren	*Troglodytes troglodytes*
*Bewick's Wren	*Thryomanes bewickii*
*Long-billed Marsh Wren	*Telmatodytes palustris*
*Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
*Swainson's Thrush	*Hylocichla ustulata*
Mountain Bluebird	*Sialia currucoides*
Western Bluebird	*Sialia mexicana*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
*Water Pipit	*Anthus spinoletta*
Cedar Waxwing	*Bombycilla cedrorum*
Northern Shrike	*Lanius excubitor*
Starling	*Sturnus vulgaris*
Solitary Vireo	*Vireo solitarius*
Red-eyed Vireo	*Vireo olivaceus*
Warbling Vireo	*Vireo gilvus*

Orange-crowned Warbler	Vermivora celata
Hermit Warbler	Dendroica occidentalis
Yellow Warbler	Dendroica petechia
Townsend's Warbler	Dendroica townsendi
Black-throated Gray Warbler	Dendroica nigrescens
Yellowthroat	Geothlypis trichas
Wilson's Warbler	Wilsonia pusilla
House Sparrow	Passer domesticus
Western Meadowlark	Sturnella neglecta
*Red-winged Blackbird	Agelaius phoeniceus
*Bullock's Oriole	Icterus bullockii
Brewer's Blackbird	Euphagus cyanocephalus
*Brown-headed Cowbird	Molothrus ater
Western Tanager	Piranga ludoviciana
Black-headed Grosbeak	Pheucticus melanocephalus
*Evening Grosbeak	Hesperiphona vespertina
Pine Grosbeak	Pinicola enucleator
Purple Finch	Carpodacus purpureus
*House Finch	Carpodacus mexicanus
Pine Siskin	Spinus pinus
American Goldfinch	Spinus tristis
White-winged Crossbill	Loxia leucoptera
Rufous-sided Towhee	Pipilo erythrophthalmus
Slate-colored Junco	Junco hyemalis
*Savannah Sparrow	Passerculus sandwichensis

Chipping Sparrow	Spizella passerina
*White-crowned Sparrow	Zonotrichia leucophrys
Golden-crowned Sparrow	Zonotrichia artricapilla
White-throated Sparrow	Zonotrichia albicollis
*Fox Sparrow	Passerella iliaca
*Lincoln's Sparrow	Melospiza lincolnii
*Song Sparrow	Melospiza melodia

MAMMALS

*American Opossum	Didelphis marsupialis
Cinereous Shrew	Sorex cinereus
*Vagrant Shrew	Sorex vagrans
*Dusky Shrew	Sorex obscurus
Water Shrew	Sorex palustris
*Marsh Shrew	Sorex bendirei
Trowbridge's Shrew	Sorex trowbridgei
*Shrew-mole	Neurotrichus gibbsi
*Townsend's Mole	Scapanus townsendi
Coast Mole	Scapanus orarius
Various Bats	Chiroptera
*Eastern Cottontail	Sylvilagus floridanus
Snowshoe Hare	Lepus americanus
*Mountain Beaver	Aplodontia rufa
Townsend's Chipmunk	Eutamias townsendi
*Eastern Gray Squirrel	Sciurus carolinensis

Fox Squirrel	Sciurus niger
Douglas's Squirrel	Tamiasciurus douglasi
Northern Flying Squirrel	Glaucomys sabrinus
*Beaver	Castor fiber
Common Deer Mouse	Peromyscus maniculatus
*Mountain Deer Mouse	Peromyscus oreas
Bushy-Tailed Wood Rat	Neotoma cinerea
Gapper's Red-backed Mouse	Clethrionomys gapperi
*Townsend's Meadow Mouse	Microtus townsendi
*Long-tailed Meadow Mouse	Microtus longicaudus
Oregon Meadow Mouse	Microtus oregoni
*Muskrat	Ondatra zibethicus
*Norway Rat	Rattus norvegicus
*Black Rat	Rattus rattus
House Mouse	Mus musculus
*Pacific Jumping Mouse	Zapus trinotatus
Porcupine	Erethizon dorsatum
*Nutria	Myocastor coypus
Coyote	Canis latrans
*Red Fox	Vulpes vulpes fulva
Black Bear	Ursus americanus
*Raccoon	Procyon lotor
*Short-tailed Weasel	Mustela erminea
Long-tailed Weasel	Mustela frenata
*Mink	Lutreola lutreola

Spotted Skunk	Spilogale putorius
*Striped Skunk	Mephitis mephitis
*River Otter	Lutra canadensis
Bobcat	Lynx rufus
Black-tailed Deer	Odocoileus hemionus

TABLE B. FLORA OF THE SEWERAGE AREA

TREES

Western Yew	*Taxus brevifolia*
*Western Red Cedar	*Thuja plicata*
Grand Fir	*Abies grandis*
Sitka Spruce	*Picea sitchensis*
Douglas-Fir	*Pseudotsuga menziesii*
Western Hemlock	*Tsuga heterophylla*
Madrone	*Arbutus menziesii*
*Quaking Aspen	*Populus tremuloides*
*Black Cottonwood	*Populus trichocarpa*
Lombardy Poplar	*Populus nigra*
Pacific Willow	*Salix lasiandra*
Scouler Willow	*Salix scouleriana*
*Red Alder	*Alnus rubra*
Hazelnut	*Corylus cornuta*
Oregon White Oak	*Quercus garryana*
Black Hawthorn	*Crataegus douglasii*
Bittercherry	*Prunus emarginata*
*Oregon Crabapple	*Pyrus fusca*
Sitka Mountain-ash	*Sorbus sitchensis*
Big-leaf Maple	*Acer macrophyllum*
Vine Maple	*Acer circinatum*

Cascara	*Rhamnus purshiana*
Pacific Dogwood	*Cornus nuttallii*
*Red-osier Dogwood	*Cornus stolonifera*
*Oregon Ash	*Fraxinus latifolia*

SHRUBS

Sitka Willow	*Salix sitchensis*
*Hooker Willow	*Salix hookeriana*
Sitka Alder	*Alnus sinuata*
Nettle	*Urtica dioica var. lyallii*
Tall Oregongrape	*Berberis aquifolium*
Redflowering Currant	*Ribes sanguineum*
Serviceberry	*Amelanchier alnifolia*
Ocean-spray	*Holodiscus discolor*
Indian Plum	*Osmaronia cerasiformis*
Pacific Ninebark	*Physocarpus capitatus*
*Salmonberry	*Rubus spectabilis*
Himalayan Blackberry	*Rubus discolor*
*Thimbleberry	*Rubus parviflorus*
*Hardhack	*Spiraea douglasii*
Broom	*Cytisus scoparius*
Mountain Balm	*Ceanothus velutinus*
Devil's Club	*Oplopanax horridum*
Bristly Manzanita	*Arctostaphylos columbiana*
Salal	*Gaultheria shallon*

*Labrador Tea	*Ledum groenlandicum*
Red Rhododendron	*Rhododendron macrophyllum*
Evergreen Blueberry	*Vaccinium ovatum*
Red Blueberry	*Vaccinium parvifolium*
*Black Twinberry	*Lonicera involucrata*
Blue Elderberry	*Sambucus cerulea*
Red Elderberry	*Sambucus racemosa*
High-bush Cranberry	*Viburnum var.*
*Water-parsley	*Oenanthe sarmentosa*
*Swamp-laurel	*Kalmia occidentalis*

OTHER FLORA

*Common Horsetail	*Equisetum arvense*
*Scouring Rush	*Equisetum fluviatile*
Dock or Sorrel	*Rumex var.*
Columbia lewisia	*Lewisia columbiana*
Chickweed	*Cerastium var.*
Anemone	*Anemone var.*
*Marshmarigold	*Caltha var.*
*Various Buttercups	*Ranunculus var.*
Fringecup	*Tellima grandiflorum*
Youth-On-Age	*Tolmiea menziesii*
Stink Currant	*Ribes bracteosum*
Little Wild Rose	*Rosa gymnocarpa*
Nootka Rose	*Rosa nutkama*
Evergreen Blackberry	*Rubus laciniatus*

Pacific Blackberry	Rubus ursinus
Various Clovers	Trifolium var.
Vetch or Wild Pea	Vicia americana
Fireweed	Epilobium angustifolium
Kinnikinnick	Arctostaphylos uva-ursi
Loosestrife	Lysimachia var.
Bittersweet Nightshade	Solanum dukamara
English Plantain	Plantago lanceolata
Western Twinflower	Linnaea borealis
Daisy Varieties	Erigeron var.
*Canadian Goldenrod	Solidago canadensis
*Western Goldenrod	Solidago occidentalis
*Marsh Cinquefoil	Potentilla palustris
*Spiked Willow-herb	Lythrum salicaria
*Sundew	Drosera spp.
*Water Plantain	Alisma plantago-aquatica
*Various Rushes	Juncus var.
*Various Sedges	Carex var.
*Various Spike-rushes	Eleocharis var.
*Various Bulrushes and Tules	Scirpus var.
Various Grasses including;	Gramineae
Sloughgrass	Beckmannia syzigachne
Wheatgrass	Agropyren var.
Wildrye	Elymus var.
Ryegrass	Lolium var.

Bluegrass	*Poa var.*
Wild Rice	*Zizania var.*
*Various Bur-reeds	*Sparganium var.*
*Common Cat-tail	*Typha latifolia*
*Skunk Cabbage	*Lysichitum americanum*
*False Lily-of-the-Valley	*Maianthemum unifolium*
*Lady-fern	*Athyrium filix-femina*
Licorice-fern	*Polypodium glycyrrhiza*
Sword-fern	*Polystichum munitum*
Bracken	*Pteridium aquilinum*

AQUATIC PLANTS

Water-fern	*Azolla mexicana*
American Water-lily	*Nymphaea odorata*
Spatterdock	*Nuphar polysepalum*
Hornwort	*Ceratophyllum demersum*
Crowfoot	*Ranunculus var.*
Broadleaf Arrowhead	*Sagittaria latifolia*
Pondweed	*Potamogeton var.*
Duckweed	*Lemna var.*

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* These species inhabit wetlands.

APPENDIX E

RELATIONSHIP WITH EXISTING AND PROPOSED, PROJECTS, PLANS, POLICIES, AND REGULATIONS

In order to clearly understand the relationship of the proposed action with existing policies, plans, and regulations, and other proposed projects, the following descriptions are provided.

THE MUNICIPALITY OF METROPOLITAN SEATTLE (METRO) PLANS

In 1959, the Metropolitan Council adopted a comprehensive report on sewerage and drainage of the metropolitan Seattle area as the official Metro Comprehensive Sewerage Plan. The plan set forth the comprehensive sewerage and drainage requirements for each of the various areas making up the metropolitan Seattle area with respect to trunk and intercepting sewers, main pumping stations, and sewage treatment and disposal facilities. It contained long range plans for stage or step construction, estimated costs of needed improvements, and factual data and conclusions relative to the physical, social, and economic conditions affecting the recommended program.

The boundaries of the Comprehensive Plan extended well beyond the constituted limits of the Municipality at that time (the present boundaries are contiguous with King County), in recognition of the importance of providing facilities to serve the ultimate development of the entire drainage area. A facility quite similar to the proposed Auburn Interceptor was included as a part of the original Metro Comprehensive Sewerage Plan, and has remained in the plan to the present time.

On February 16, 1961, the Metropolitan Council adopted a 10-year schedule to construct certain facilities in its Comprehensive Plan. These facilities constituted the central or "core" portion of the metropolitan system. In keeping with the philosophy of providing essential services to the entire metropolitan area as contained in the legislative act authorizing formation of metropolitan municipal corporations, the Metropolitan Council authorized construction of core facilities with sufficient capacity to serve the entire metropolitan area even though much of this area was outside the boundary of the Municipality at that time.

The first phase of the Metro program, which has been completed, extended sewer service to many areas not previously served by Metro. Metro believes additional facilities to be constructed during the second stage program have now become necessary to maintain receiving water quality at the levels required by regulatory authorities and the general public, as well as to keep up with the growth of the metropolitan area. An interceptor running from Auburn to Metro's Renton sewage treatment plant (S.T.P.) is such a facility. The Metropolitan Council authorized the construction of the Auburn Interceptor in 1974, subject to the execution of an Agreement for Sewage Disposal with the City of Auburn. Such an agreement was adopted by Metro and the city pending Metro acceptance of a grant from EPA for construction of the interceptor.

The continued operation of the Auburn Lagoon does not conform to Metro's existing Comprehensive Sewerage Plan, the Puget Sound Governmental Conference's Interim Regional Development Plan, and the Washington State Department of Ecology's Implementation and Enforcement Plan for Intrastate Waters. The Federal Water Pollution Control Act Amendments of 1972 place additional restrictions upon the continuing operation of the existing Auburn Lagoon in that secondary treatment at all sewage treatment plants is required by July 1, 1977.

Metro's Comprehensive Plan is based on gravity flow in natural drainage basins and provides for a regional sewerage system running from Everett to the north, the foothills of the Cascades to the east, Puget Sound to the west, and the Pierce County line to the south. The concept of such regional systems, known as "regionalization", was inspired by the Federal Water Quality Act of 1970.

The intent of the regional service concept, as interpreted by DOE, is to limit the number of point source discharges in order to effect better control of water quality within a drainage basin. According to DOE, "in a heavily populated area such as King County, numerous small or medium size commercial and domestic discharges receiving varying degrees of treatment impose an intolerable burden upon the rivers, streams, and lakes of the region. The most efficient, and perhaps the only effective, means of controlling such a situation is by interception, treatment, and discharge of these wastes on a regional basis." Since the 1972 Amendment, however, emphasis has shifted to cost-effective systems. This directs EPA to consider with equal weight individual treatment facilities, as well as other alternatives to a regional system.

In 1971, as the Federal government began to emphasize basin planning programs, the water pollution control commission asked King County and Metro together to suggest ways of developing such a plan. Local governments and agencies in the Cedar and Green River basins were invited to form a committee for conducting the planning effort for Metro. Representatives from nine cities and agencies together established the River Basin Coordinating Committee. As the river basin program took shape under the direction of this committee, it became apparent that funding and legislative responsibilities for the program should be under the control of elected representatives. At the request of the committee, the Metropolitan Council assumed legal and financial responsibility for the effort. Under the guidance of the River Basin Coordinating Committee, consultants compiled a unique series of four environmental studies which deal directly with all aspects of water and waste management in the Cedar and Green River basins. The PSGC Interim Regional Development Plan was used as the basis for population and land use forecasts. These include the Water Quality Management, Water Resources Management, Solid Waste Management and Urban Drainage Studies.

The Water Quality Management Study developed a management plan to achieve and maintain high water quality in the major bodies of water within the Green and Cedar River basins. Data on water quality and existing and potential sources of pollution have been collected. These pollutants result from urban runoff and industrial wastes, as well as storm and sanitary sewer systems. This study utilizes water quality and quantity models which simulate stream and river flows for flood and drought conditions. Thus, it relies on the models developed in the Water Resources Management Study. The Water Pollution Control and Abatement Plan, resulting from this study, will establish water pollution control needs including plans for sewer trunk lines, pump stations, interceptors, and industrial treatment plants. This will include a capital improvement plan as well as a non-facility implementation plan.

The recommendations of the RIBCO studies are about to be published and an extensive citizen and agency review is underway. The Water Quality Management Study recommendation for sewerage facilities in the Metro service area essentially follows the existing Metro Comprehensive Plan, including the Auburn Interceptor. The resulting information has been used by EPA in making an independent analysis of Metro's proposals.

STATE OF WASHINGTON WATER QUALITY STANDARDS

On January 8, 1970, the Washington State Water Pollution Control Commission (later reorganized and renamed as D.O.E.) adopted a regulation relating to water quality standards for all intrastate surface waters of the State of Washington and a plan of implementation and enforcement of such standards. This regulation classified the Lower Green River, including the reach below the Auburn Lagoon's outfall, as Class A Water (Excellent).

The City of Auburn was included in an earlier Implementation and Enforcement Plan for Water Quality Standards and was advised by letter dated February 17, 1970, that the interception of the Auburn Sewage Treatment Plant to the Metro Sewerage System was required. This directive letter included the following time schedule for completion:

> Contract execution for engineering services - July 1, 1970.
>
> Completion of engineering report - October 1, 1970.
>
> Completion of construction plans and specifications - April 1, 1971.
>
> Arrangement of financing, advertising for bids, and start construction - October 1, 1971.
>
> Facilities placed in operation - April 1, 1973.

As early as August 11, 1969, the Water Pollution Control Commission stated that the use of the Auburn Lagoon should be limited to three years. The State Implementation and Enforcement Plan supported this statement with legal enforcement powers, which the DOE soon utilized.

To ensure compliance with its February directive, the DOE, in May of 1970, stated that approval of future extensions of Auburn's local sewerage system would be denied until such time as the City consummated a service agreement with Metro. This ban on sewer extensions is no longer in effect, although it remained in force until 1974.

LAND USE AND SEWERAGE PLANS

Land use studies and plans are the basis of the planning process of establishing guidelines for the orderly development of an area. Their use serves as a guide for locating parks, schools, roads and highways, and in the determination of utility requirements. Land use plans are also a functional device directing the establishment of zones for various units of residential, commercial, industrial, and agricultural land uses of an area. Land use plans also form an essential part of population projections, for future growth is typically allocated according to proposed land uses.

Only the local governmental bodies within the State of Washington have actually been given the power to control and direct the use of the land within their jurisdictions, utilizing such measures as zoning actions. Many governmental bodies which lack legal enforcement powers nonetheless create plans which act as guides for development and growth. Because local comprehensive plans are adopted and approved by elected representatives, the land uses proposed by the Green River Sewerage Area local comprehensive plans supposedly represent the desires of the study area residents. The comprehensive land use plans are the only existing identifiable growth and development policy statements regarding land use within the sewerage area which can be implemented and enforced at this time.

THE PUGET SOUND GOVERNMENTAL CONFERENCE (PSGC) INTERIM REGIONAL DEVELOPMENT PLAN

This plan, adopted on August 12, 1971, integrates local governments' Comprehensive Plans with the Regional Open Space Plan adopted by the cities and counties of the region in 1965 and provides a comprehensive statement of goals and policies for the region.

Within the Green River Sewerage Area, the land use element of the Interim Regional Plan has generally supported the continuation of existing land uses with the notable exception of the valley bottom areas. In the Green River Valley, except for those areas presently committed to more intensive uses (those areas already provided with public facilities encouraging urban growth and industrial-commercial development), the Interim Regional Development Plan encourages agricultural and open space uses. This feature of the IRDP conflicted with portions of some local comprehensive and land use plans. One major conflict area, involving over 1,740 acres of land west of Auburn's city center, became a major regional issue associated with a great deal of debate and controversy since March 1972. This conflict area was resolved and the IRDP amended to reflect the compromise solution reached between Auburn and the PSGC. The utilization of most of this conflict area for industrial-commercial uses would now be consistent with the Regional Land Use Plan.

A sewerage element of the IRDP shows present and future (1990) facilities. An Auburn Interceptor is consistent with this plan as are subsequent interceptors and trunks serving the West Valley and Big Soos Creek areas.

COMPREHENSIVE PLAN FOR KING COUNTY

This plan, adopted in October, 1964, defines the goals and provides general guidance for the continuing development of King County. This plan proposes some industrialization of the Kent and Auburn areas; however, open space areas are specified as being valuable to preserve within the Green River valley. The implementation of the King County Plan has, however, been made ineffectual by the planning policies and annexations of Kent and Auburn; today, very little county jurisdiction remains within the Green River valley bottom.

The King County Plan does give consideration to the value of green-belt, agricultural, or open and recreational areas by designating portions of the Upper Green River valley and Enumclaw Plateau as agricultural reserves or very low density (less than two dwelling units per acre) residential areas. Though extreme developmental pressures occur, King County favors a policy of retaining the agricultural functions and open space areas of these unincorporated portions of the county for as long as possible, rather than allowing widely scattered subdivisions to develop between Auburn and Enumclaw.

PIERCE COUNTY COMPREHENSIVE LAND USE PLAN

This plan, adopted on April 2, 1962, affects approximately seven square miles in the extreme southern portion of the Green River Sewerage Area. Much of this area, north and east of Lake Tapps and south of the White River, is designated as rural residential. This classification identifies areas which lie outside of the path of immediate urban expansion and beyond the areas of suburban residential development provided with adequate public services. Rural residential uses are recommended within the Pierce County portion of the study area in order to avoid the premature and uneconomic extension of public facilities and services.

The reservation of potential residential land in sufficiently large parcels to permit proper subdivision at a future date is also a beneficial feature of this proposed land use. Pierce County has also recognized that the provision of areas where rural living can be enjoyed with a minimum of use restrictions within reasonable commuting distance of major employment centers complements more urban and suburban residential areas.

KENT'S REVISED COMPREHENSIVE PLAN

This plan, adopted October 18, 1971, designates most of the valley flat-land north of the core area of Kent and lying between the Green River and the Valley Freeway as industrial. The land south of the core area, between the West and East Valley Highways is also proposed to be developed for industrial purposes. Proposed commercial districts are in the central business district, at the intersections of major highways, and in areas where local neighborhood shopping districts are determined to be needed and already exist.

Agricultural uses are proposed in two areas presently south of Kent's corporate city limits in King County. The plan notes that many factors, most of which are beyond the control of local government, may require a change in this land's use to something other than agriculture, and therefore, the designation as agriculture may be regarded as desirable but transitional. The flat valley ground west of the Green River and north of the Kent-Des Moines Highway is proposed generally as Residential-Agriculture. Residential areas are situated primarily on the plateau areas east and west of the Green River Valley and in existing residential areas on the valley floor. The Kent planning area population projection for 1988 anticipates 145,000 residents. In 1970 Kent contained 16,275 residents.

The PSGC has determined that the industrial space requirements for King County will be approximately 6500 acres in the year 2000. Since approximately 3200 acres were estimated to be in industrial use in 1970 this indicates that only an additional 3300 will be needed by the year 2000. Because of the technique used in generating the King County employment forecasts and because the land per employee ratios are calculated at the aggregated level of total manufacturing, which is by no means a homogenous category, this forecast of industrial space requirements for King County must be considered a gross approximation. The PSGC has therefore calculated a range of industrial space requirements under the assumption that the true requirements will be within 15% of those forecasted. The range indicates that between 2,340 acres and 4,300 additional acres will be required for manufacturing and wholesaling uses by the year 2000.

Kent, therefore, has enough already committed industrially-zoned land, served by existing Metro sewer systems and an adequate city water system, to provide for all of the projected industrial development likely to occur by 2000 within King County. Industrial development of the Kent vicinity would be consistent with all applicable regional plans.

Despite the fact that almost all of the Green River valley north of Kent is comprised of agricultural soils, the Puget Sound Governmental Conference has approved the Kent Comprehensive Plan. Regional policy of focusing development in existing utility and service areas seems to have been more important than the regional policies which recommend the retention of naturally suitable open space and the conservation of critical natural processes and resources. The policy of encouraging self-sufficient, identifiable communities and reducing the need for long-distance commuting also seems to support the Conference's industrial designation of the valley bottom north of Kent. When the City of Kent Planning Commission attempted to revert some of the industrial areas on their comprehensive plan to agricultural designations, property owners (80% non-residents) of these areas prevented such action.

AUBURN'S COMPREHENSIVE SEWERAGE AND LAND USE PLANS

The Auburn sewerage plan was completed in November 1968. Several recommendations for the enlargement and improvement of Auburn's sewerage system were proposed, including the continued extension of sewer service to areas beyond the city limits. Nearly the entire Southwestern quadrant of the Green River Sewerage Area, including Auburn, Algona, Pacific, and portions of Pierce and King Counties, was proposed to be served by the Auburn system. The plan also recommended that the ongoing city sewer separation program be continued. Various other improvements and enlargements to the sewer collection and treatment system were detailed.

The plan determined that the existing Auburn Sewage Treatment Plant, a two stage stabilization and oxidation pond, was loaded to about ninety percent of its 1968 design capacity. Information available at that time indicated that its capacity would be exceeded by 1970. The Comprehensive Plan recommended that the existing lagoon system be improved by the construction of four additional six acre aerated lagoon structures. This system was determined to be capable of adequately treating the projected 1980 BOD loadings of 11,200 lbs/day and average flows of 5.3 mgd, plus industrial waste water flows averaging 0.6 mgd.

At the same time, the plan also recommended that the City of Auburn begin preliminary planning and discussions that would lead to Auburn's joining Metro for the treatment and disposal of its sewage. After further study of alternatives to joining Metro, the City of Auburn began negotiations with the Municipality. These negotiations continued for nearly five years before an agreement was approved.

Auburn's Comprehensive Land Use Plan, which was adopted February 17, 1969, suggests that a substantial amount of the projected growth of the Seattle Metropolitan area should be absorbed by the Green River valley. Auburn's central location, and possession of major transportation systems and large quantities of undeveloped land, were viewed as an advantage to the Auburn area with respect to its ability to compete for industrial and population growth. The saturation population estimates for the Auburn Planning Area range between 98,000 and 121,000 people according to the Comprehensive Plan. Auburn's 1970 population was 21,817. Implementation of Auburn's Comprehensive Plan would be consistent with the PSGC's Interim Regional Development Plan.

ALGONA'S COMPREHENSIVE PLAN

This plan, adopted in March, 1972, supports the industrialization of the eastern third of the city. Residential land uses and a small area devoted to commercial development occupy the remainder of the city. Of the 770 acres of land in the City of Algona, almost sixty percent remains devoted to some form of productive agricultural use or is classified as nonproductive and vacant land. Much of the Algona Comprehensive Plan continues to conflict with the Puget Sound Governmental Conference's Interim Regional Land Use Plan, which suggests that the combination of existing agricultural production and open space uses is optimal. Algona and the Conference are working to resolve differences.

Algona is presently served by the Auburn Treatment Plant. Under a joint agreement with Pacific, a new sewer system was completed in 1973. About sixty percent of Algona is served by this system. Algona officials note that the areas presently unserved are not yet populated enough to justify sewer facilities. As development occurs in the remaining agricultural or vacant areas, sewers would be constructed as required by the City of Algona.

PACIFIC'S PROPOSED COMPREHENSIVE PLAN

This proposed plan completed in November, 1969, stresses the desired residential character of the town. Low density residential areas are proposed to occur on the Des Moines Plateau, above the probable future extension of the Valley Freeway, and separated from it by an existing forested open space buffer zone along the valley wall. Medium density and multi-family housing will comprise the valley bottom portion of Pacific, according to the unadopted plan.

Industrial development is limited to the area adjacent to the future freeway route and that portion of Pacific between the White River and the Chicago, Milwaukee, St. Paul, and Pacific Railroad main line. The streamway and shores of the White River are designated as proposed parks.

Pacific's wastes are treated by the existing Auburn Lagoon, and approximately ninety percent of the town is served by a reasonably adequate sewer system. Only the southwestern portion of Pacific and a small development along the Valley Highway are unsewered.

BLACK DIAMOND'S COMPREHENSIVE PLAN

This plan, adopted in May 1968, anticipates moderate growth and development in the town, yet ignores the serious water quality problems which have plagued the Black Diamond area for years. Black Diamond officials do acknowledge that anticipated growth will further degrade water quality without the construction of adequate wastewater collection and treatment facilities. Therefore, sewers are now a top priority need in this community. The lack of an adequate sewer system is hampering growth. Black Diamond presently has three unrelated small community systems, one serving 7 houses, another 9, and the largest serving twenty-two homes.

PROJECTS IN THE GREEN RIVER SERVICE AREA

The following are projects for the Green River Service area which are now in various stages of planning and implementation.

These projects of both industry and government will greatly influence the growth and development of the service area. In turn, the kind of sewerage treatment system finally selected for Auburn may have a significant impact on the feasibility of these projects.

COMMERCIAL PROJECTS

Commercial development planned for the valley includes the Auburn 400, a 100 acre regional shopping center in Auburn with a 350 acre industrial park in Auburn and Algona; Trillium, a Highrise business and recreational complex in Southcenter; Glacier Park, 56 acres owned by Burlington Northern filled and for sale to industries; Black River Junction Industrial Park, a now partially-filled property owned by the Milwaukee Land Company; Uplands Industries (UPRR), an industrial park approximately 1/2 square mile; and a Shell Tank Farm in Renton.

SOIL CONSERVATION SERVICES'S (SCS) GREEN RIVER WATERSHED PROJECT

This proposed comprehensive drainage plan will provide a 55-mile system of drainage channels which are designed to collect and carry runoff to pumping stations where it will be discharged into the Green River. If this system is supplemented by local feeder canals and land treatment measures, it would afford 100-year protection against lowland ponding. Construction has been delayed by the necessity under NEPA to assess the impacts of this project on the environment. The SCS is preparing an EIS on this proposed project.

CORPS OF ENGINEERS PROJECTS

Involvement of the Corps would be necessary for two projects that have been suggested for the Green River. Benefit and cost-sharing studies would be required before either project could be implemented. Utilization of unused summer storage capacity of about 70,000 acre-feet at Howard A. Hanson Dam for low-flow augmentation, fisheries enhancement, or for water supply would required modification to the reservoir and its operation. However, the dam itself would not need to be raised. The City of Tacoma has expressed an interest in using the storage for future, long-term water-supply needs, but at the moment is relying on the recently developed North Fork well system for its growing demands. The Washington State Department of Fisheries is also interested in using the storage to increase the minimum summertime flows of the Green River. Preliminary RIBCO studies have indicated that low flow augmentation would benefit water quality. The second project concerns additional flood control on the Green-Duwamish River. If the SCS project or a similar pumped drainage project is completed, then the storm drainage discharge from this plus the normal flood releases from Howard Hanson Dam would exceed the existing river channel capacity. This would cause bank overtopping in some low areas, particularly in Tukwila, and would endanger existing dikes in many places from Auburn downstream. The Corps evaluated several alternatives in a flood control study and recommended improving levees where deficient with setbacks where desired for riverside park developments. Continuation of this flood control study depends upon a statement of willingness of King County to sponsor construction of the project. Cooperation and cost-sharing by the cities involved would presumably be coordinated by the county as principal sponsor.

STATE HIGHWAY DEPARTMENT PROJECTS

As funds become available, it is expected that the Valley Freeway, SR 167, from Renton through Puyallup to Fife and the Port of Tacoma will be completed. This will make the Green River valley more accessible.

POLICY ON STORAGE FOR LOW FLOW AUGMENTATION IN A FEDERAL RESERVOIR

Any well-designed water quality management program must necessarily be concerned with the quantity and quality of the receiving waters as well as the waste discharge. Minimum receiving flows must be of such quantity and quality that treated waste discharges will not cause violations of water quality standards in the stream.

As noted, dry-season flows in the Green-Duwamish River are of insufficient quantity and quality to adequately assimilate projected future secondary effluent loadings at Renton. Low-flow augmentation provided from conservation storage in the U.S. Army Corps of Engineers Howard Hanson Dam and Reservoir has therefore been suggested as an alternative to meeting water quality standards in that area.

Section 102(b) of the Federal Water Pollution Control Act Amendments of 1972 requires, in part, that in the planning of any reservoir by a Federal Agency, inclusion of storage for regulation of stream flow for water quality control shall be considered except that such storage shall not be provided as a subsititue for "adequate treatment" or other methods of controlling waste as the source. The Act further provides that the need for, value and impact of storage for water quality control shall be determined by EPA. Costs of streamflow regulation features incorporated in any Federal reservoir or other impoundment under the provisions of the Act shall be determined and the beneficiaries identified and if the benefits are widespread or national in scope, the costs of such features shall be nonreimbursable.

Advances in pollution control technology indicate that reservoir storage for water quality control is generally a poor substitute for point source pollution control measures, but would be a viable control alternative particularly where both point and nonpoint pollutants are involved. As a basic element of flow regulation policy, the best available point source pollution control technology economically achievable together with best available management practices for nonpoint source pollution shall be provided prior to provisions for water quality storage. The best available point source control technology includes advanced waste treatment techniques, land disposal, process and procedure innovations, changes in operating methods and other alternatives. Nonpoint source best management practices include land treatment practices to control run-off, application practices for pesticides and fertilizers control, water application practices for irrigation return flow control, vegetation, and shading practices for temperature control and efficiency and recycling practices to control or minimize stream diversions and flow reductions.

Application of the best technology economically achievable may not be sufficient, in all instances, to attain the desired water quality. Additionally, pollution from natural or nonpoint sources may not be amenable to effective control with the techniques that are, or are expected to be, available in the foreseeable future. In these instances, the Federal government is authorized to give consideration to providing reservoir storage for water quality control as a means of meeting instream water quality standards.

The environmental and economic gains obtainable from meeting water quality standards, or in their absence the selected water quality goals, cannot be fully evaluated in monetary terms. However, such benefits are considered to be at least worth the cost of implementing the best water quality management plan to meet the standards or goals. Where the plan includes flow regulation from incremental water quality storage in a reservoir project as a supplement to "adequate treatment", the value of such storage, particularly downstream economic losses prevented, shall be assessed in monetary terms to the extent practicable. Other environmental values not subject to economic evaluation shall be accounted for and described qualitatively. Water quality monetary benefits shall not be credited to flow regulation storage designated for purposes other than water quality control.

Beneficiaries of flow regulation for water quality enhancement beyond that produced by the employment of the best available pollution control technology and management practices are primarily the dischargers of the treated point or nonpoint source wastes that the augmented flow is intended to assimilate. Without the augmented flow, losses in land and water use values would accrue or higher cost alternatives (e.g., reduction or relocation of the waste-producing activities or reconstruction of industrial plants and facilities) would be required to meet the water quality standards. Many beneficiaries should be identifiable from an inventory of point waste source dischargers and nonpoint source land and water users.

Section 102(b) of the FWPCA amendments of 1972 requires, for cost reimbursement determination purposes, that an assessment be made of the extent to which the benefits of flow regulation for water quality control are widespread or national in scope. Generally, if a relatively large area and population is involved and if Federal and State funds are being provided to obtain "adequate treatment" or other controls at the source to meet National Water Quality Goals, the benefits of flow regulation needed to complement this program would be widespread and national in scope.